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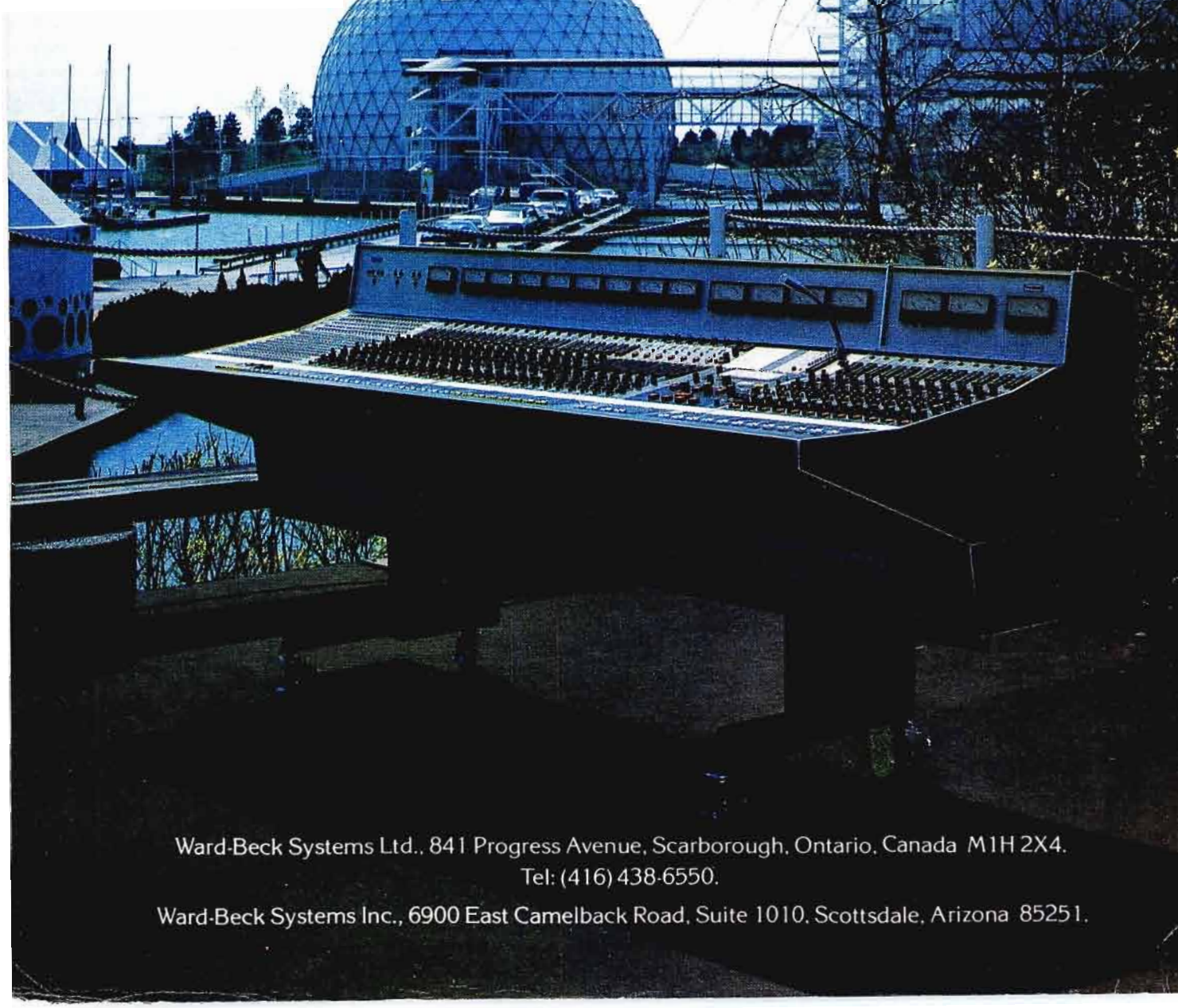

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BROADCAST engineering

The journal of the broadcast-communications industry

September, 1978 / Volume 20 / No. 9

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THE COVER

Our Buyers' Guide this year has entailed an extensive review of the broadcasting industry's equipment and its sources. Because of the growth in this industry, we could not capture its breadth in a single photo as typically presented on our covers. Consequently, we conceived the cover portraying in the background a running list of components and systems faced daily by broadcast engineers, managers, and purchasing agents in operating, designing, and maintaining the world's finest communications systems.

Editorial, advertising and circulation correspondence should be addressed to: 9221 Quivira Road, P.O. Box 12901, Overland Park, KS 66212 (a suburb of Kansas City, MO), (913) 888-4664.

EDITORIAL
Bill Rhodes, *Editorial Director*
Cindy Nelson, *Managing Editor*
JoAnn Vella, *Editorial Assistant*
Beth Brugman, *Editorial Assistant*
Pat Fox, *Directory Editor*
Dudley Rose, *Art Director*

TECHNICAL CONSULTANTS
Howard T. Head, *FCC Rules*
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BROADCAST ENGINEERING is published monthly by Intertec Publishing Corporation, 9221 Quivira Road, P.O. Box 12901, Overland Park, KS 66212. **BROADCAST ENGINEERING** is edited for corporate management, engineers/technicians and other station management personnel at commercial and educational radio and TV stations, teleproduction studios, recording studios, CATV and CCTV facilities, and government agencies. Qualified persons also include consulting engineers and dealer/distributors of broadcast equipment.

SUBSCRIPTIONS: BROADCAST ENGINEERING is mailed free to qualified persons in occupations described above. Non-qualified persons may subscribe at the following rates: U.S., one year, $20; all other countries, one year, $26. Back issue rates, $3, except for the September Buyers' Guide issue, which is $10. Rates include postage. Adjustments necessitated by subscription termination at single copy rate. Allow 6-8 weeks for new subscriptions or for change of address. Controlled circulation postage paid at Kansas City, MO.

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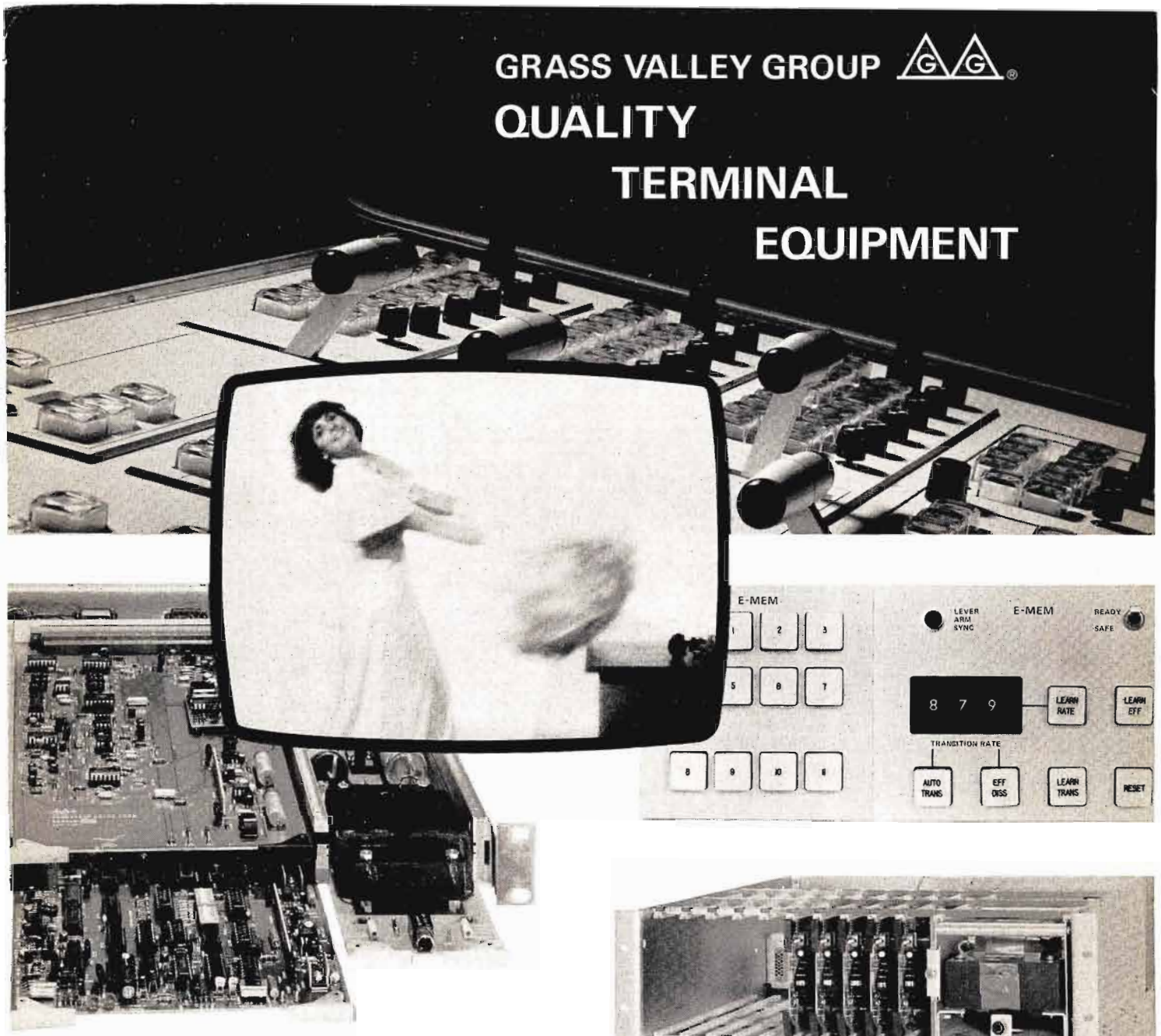

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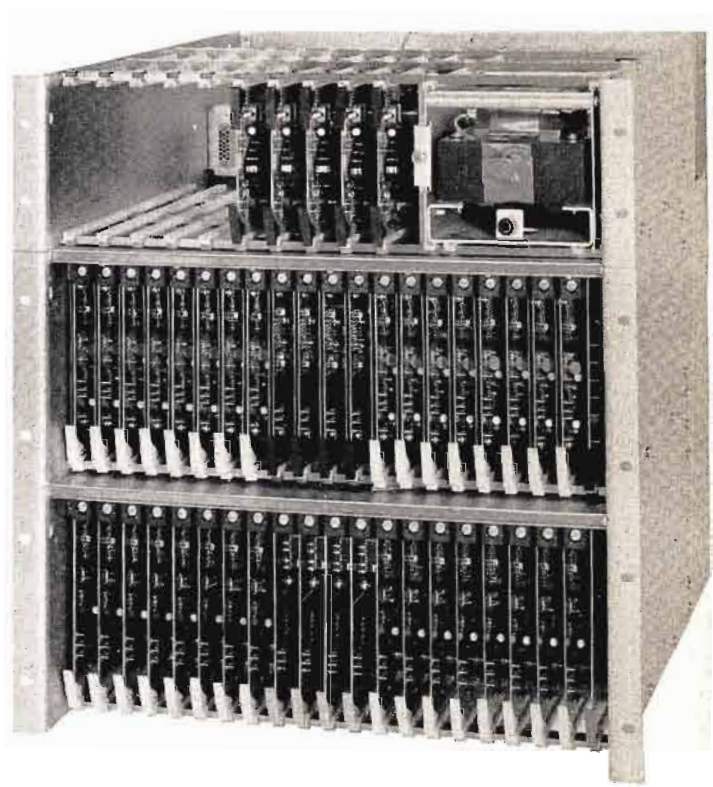

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September, 1978/By Howard T. Head and Harold L. Kassens

UHF-TV receiver noise figure

On May 19, 1978 the FCC decided to lower the noise figure for UHF-TV receivers. In a burst of speed, it released on August 4th the report and order setting forth its final decision. The reduction is from 18 dB to 14 dB for all new models submitted for certification after October 1, 1979 and all sets manufactured after October 1, 1981. A further reduction from 14 dB to 12 dB was ordered on all new models submitted for certification after October 1, 1982 and all sets manufactured after October 1, 1984.

The latter requirement was hedged to the extent that, if experience warranted, the dates might be moved up and the second stage reduction to 12 dB could even be decreased to 10 dB. The commission also said that "it believed that lowering the noise figure to 14 dB could be done without imperiling its ability to reduce the UHF 'taboos' and without causing cost inefficients or other serious adverse impacts to the public interest such as inhibiting the use of electronic (push-button) tuners."

It also indicated that it would open new proceedings to improve other aspects of UHF-TV set performance which influence the quality of reception. The commission would consider the labeling of sets, ancillary service, grading of antennas and lead-in wires as well as transmitter operations. A petition for reconsideration of the 12 dB noise figure is assured.

Land mobile directional antennas

Because of severe interference to land mobile operations in the San Diego area due to the use of land mobile operations from high elevation sites in the Los Angeles area--particularly Mount Wilson, Mount Lukens and Santiago Peak--the FCC has issued a notice of inquiry and proposed rule making looking into requiring directional antennas for stations with such interference potentiality.

continued on page 6

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FCC update

continued from page 4

The FCC observed that the situation is unique to the Southern California area and is mainly the result of the topography and the radio propagation characteristics along the coast. Mexican radio broadcasters in Baja California have been complaining about a similar situation in FM for years.

AM stereo - FM quad up-date

The commission scheduled a discussion of AM stereo and FM quad for July 27th. Subsequently, the date was shifted to August 8th. At the request of the chief engineer, there was an additional postponement to September 13.

We understand that the broadcast bureau has a notice of proposed rule making prepared on both subjects. But some staff members still are concerned about technical aspects such as frequency response, adjacent-channel interference and skywave propagation. The office of chief engineer continues to raise the questions of 8 kHz or 9 kHz channel frequency separation in the AM band and 100 kHz separations in FM.

Unless some of the insiders become obstreperous, a decision on AM stereo by the time of the NAB convention in Dallas in March, 1979, is a good possibility. The date for an FM quad decision is anybody's guess.

Short Circuits

In spite of issuing the wrong press release, the FCC really did amend its rules to prohibit the marketing of linear amplifiers capable of operating on any frequency from 24 to 35 MHz and to require type-acceptance of all equipment marketed for use in the Amateur Radio Service...The processing line at the FCC will have all applications for major AM changes studied for acceptance and be on a current basis by September 1, 1978. The delay in processing applications for minor AM changes has now grown to a minimum of six months...The Texas Pawnbrokers Association, representing 255 pawnbroker shops, was turned down in its request to the FCC for an extension of the January 1, 1978 date after which the sale of 23-channel CB units has been made illegal. It seems they may be left with somewhere between 5100 and 6375 units at an average value of $40 each.

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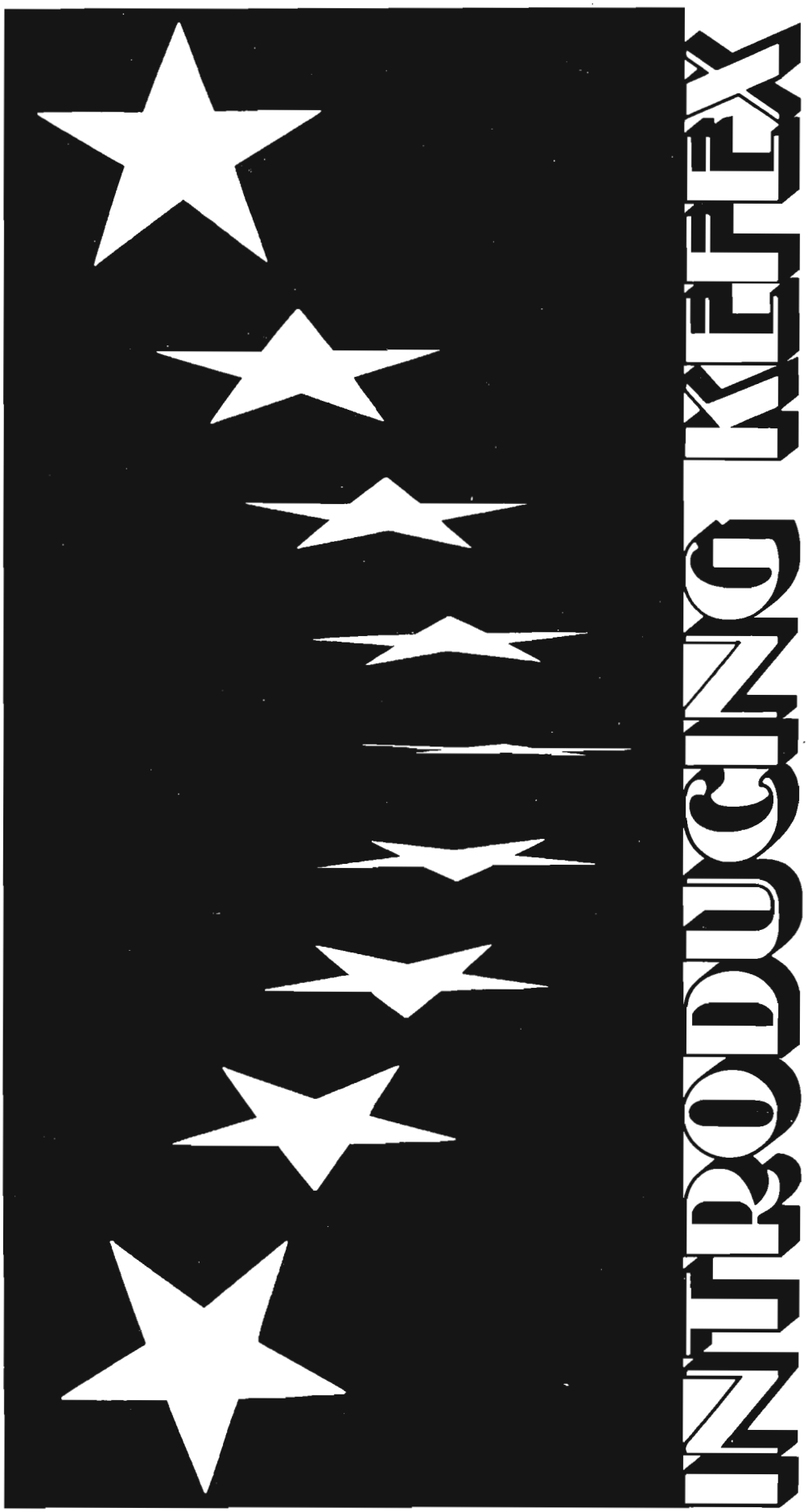

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Publisher's Note:

New editorial director named for Broadcast Engineering

Broadcast Engineering features with this issue a new name on the masthead. Bill Rhodes, former editor of *Electro-Technology,* a magazine previously owned by Industrial Research, Inc., and absorbed by Dun-Donnelley Publishing Corporation. Rhodes brings to **Broadcast Engineering,** as editorial director, a broad background in RF communications, radio wave propagation and technical journalism.

Rhodes holds a MS degree in physics with an emphasis in solid-state electronics and wave propagation. His undergraduate work was in both physics and mathematics. His career, in addition to his experience in technical publishing, has encompassed virtually every facet of communications and includes the development of an all solid-state mobile broadcast system.

Organizations and companies that Rhodes has worked for include B&K Instruments, International Rectifier, Indiana University, Midwest Research Institute and Boeing Aircraft. Rhodes has been involved in engineering and research in various areas, including computers, minicomputers and microprocessors; the selection of servomotors and servo systems; and the evolution of recorders, oscilloscopes and counters.

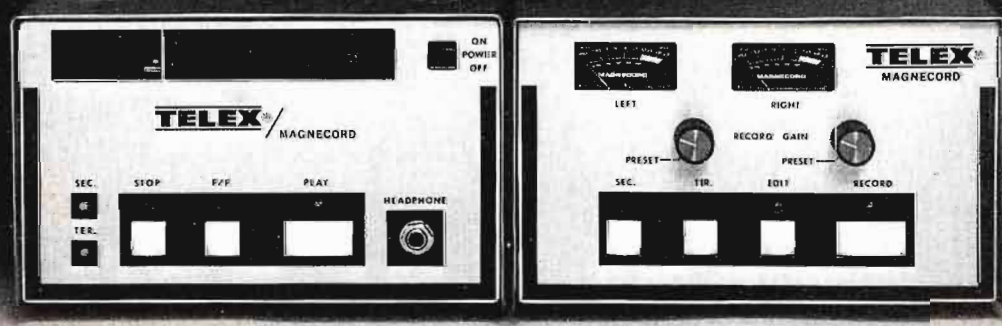
In addition, he has conducted pioneering studies on the magnetic properties of ferrite materials. Rhodes also developed the first application of the LASER in the area of cryogenic research.

If Bill can be of any help, contact him directly. He will be covering the SMPTE conference in October, so introduce yourself if you are there.

Finally, please note our added Business News department, a new name for Howard Head and Harold Kassen's exclusive column "FCC Update," and our redesigned table of contents. **Broadcast Engineering** continues to be the technology magazine for the broadcast industry.

George Laughead

At Last,
a Cart Machine that Keeps its Cool



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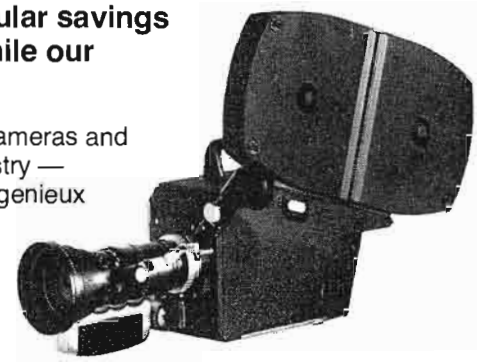

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industry news

FCC Commissioner attacks rewrite

FCC Commissioner Tyrone Brown issued a sharp attack on the broadcast provisions of a bill (H.R. 13015) which would replace the Communications Act of 1934. Testifying before the House Subcommittee on Communications, Brown said that adoption of the bill would make the broadcast license "A license to print money with few if any public responsibilities attached."

Taking sharp issue with the general approach of the bill's broadcasting sections, Brown said "the problem with H.R. 13015 is that it would completely abandon the public interest standard. The bill would permit broadcasters to totally ignore discussion of controversial issues in their programming."

He took particularly strong exception to the bill's proposal to relieve the FCC or its successor of jurisdiction "to demand of broadcasters the kind of affirmative equal employment efforts the FCC has insisted upon since 1967."

"Because of the physical limitations of the broadcast spectrum, and given the many applicants for its use, government must be involved in its allocation. Those who are granted the opportunity to use this national resource—to the exclusion of all other claimants—receive a valuable privilege. It is not unreasonable to require that use of this public resource for private gain shall be conditioned on operation consistent with the public interest," Brown said.

NRBA meets on Act rewrite

In a recent meeting, members of the NRBA board of directors and chairman Van Deerlin of the House Subcommittee on Communications discussed and analyzed the proposed Act of 1978 (H.R. 13015).

A caucus of the NRBA directors indicated almost unanimous approval that a recommendation be made to the NRBA board to actively support the radio portion of the rewrite.

NRBA has campaigned for the total deregulation of radio and believes that H.R. 13015 can achieve this with benefits for the public as well as for the radio industry.

NRBA feels that the proposed spectrum or leasing fee should be a fixed amount protected from future escalation and that the number of stations permitted per owner or market should be different than presently proposed.

Common carrier title

Testifying before the House Communications Subcommittee on Title III of House bill H.R. 13015, FCC Chairman Charles D. Ferris emphasized five major areas of agreement with its provisions for

continued on page 12

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   b. master time code generators.
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2. CMX products make
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   b. sense.
   c. happy clients.
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3. CMX systems are (fill in the blank) computer assisted editing systems in the world.
   a. the most widely used
   b. used to produce more prime time video tape programming than any other
   c. the most flexible
   d. the most expandable
   e. the most proven
   f. the most powerful
   g. the most efficient
   h. the most cost effective
   i. interfaced with more different VTRs, ATRs, and switchers than any other
   j. the industry standard for

4. CMX equipment is used by
   a. all United States networks.
   b. all major United States post production facilities.

5. CMX equipment is in daily use in
   a. the United States.
   b. Canada.
   c. Australia.
   d. Japan.
   e. Latin America.
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6. CMX systems is
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   b. have a CMX salesman call on me.
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1)abcd 2)abcdefghi
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continued from page 10

domestic and international common carrier regulation.

- H.R. 13015 would provide a clear Congressional mandate that competition in telecommunications should be the rule and monopoly the exception.
- The bill provides the regulatory agency with a clear option not to use available regulatory tools when reliance on market forces would adequately protect the public.
- The bill includes a reassessment for the commission's current inventory of regulatory tools, especially its certification and tariffing powers.
- The bill properly includes legislative resolution of certain critical questions regarding industry structure.
- The bill recognizes the growing importance and complexity of international communications issues.

Ferris, however, disagreed with provisions curtailing or eliminating FCC regulatory powers. Instead, he argued for increased regulatory options for the FCC.

NAB membership climbs

Membership in the National Association of Broadcasters during the past year increased by 507 for an all-time high of 5,727.

Radio membership is up 340 (146 AM; 194 FM) for a total of 4,579 (2,611 AM; 1,968 FM), television from 547 to 558 and associate membership from 434 to 590.

Control interface committee formed

The Society of Motion Picture and Television Engineers has organized a committee titled Working Group on Control for Interface of Television Broadcast Studio Equipment.

An optional control interface for videotape recorders, film chains, character generators, still stores, audiotape decks, audio consoles, video switchers, frame synchronizers, time base correctors, noise reducers, digital effects, etc., will be made available to the industry by the committee.

The committee hopes to have the industry reach agreement on the style, protocol, format and language of a digital communications scheme to permit all equipment (optionally) in the industry to talk, listen and command, if necessary.

SMPTE awards announced

The Society of Motion Picture and Television Engineers will present the 1978 Journal award to Eugene Leonard of Da Vinci Systems Group at the 120th Technical Conference in New York. The award is for his paper entitled *Implications of Digital Video Graphics,* published in the October 1977 SMPTE *Journal.*

Honorable mention goes to K. Staes, Agfa-Gevaert

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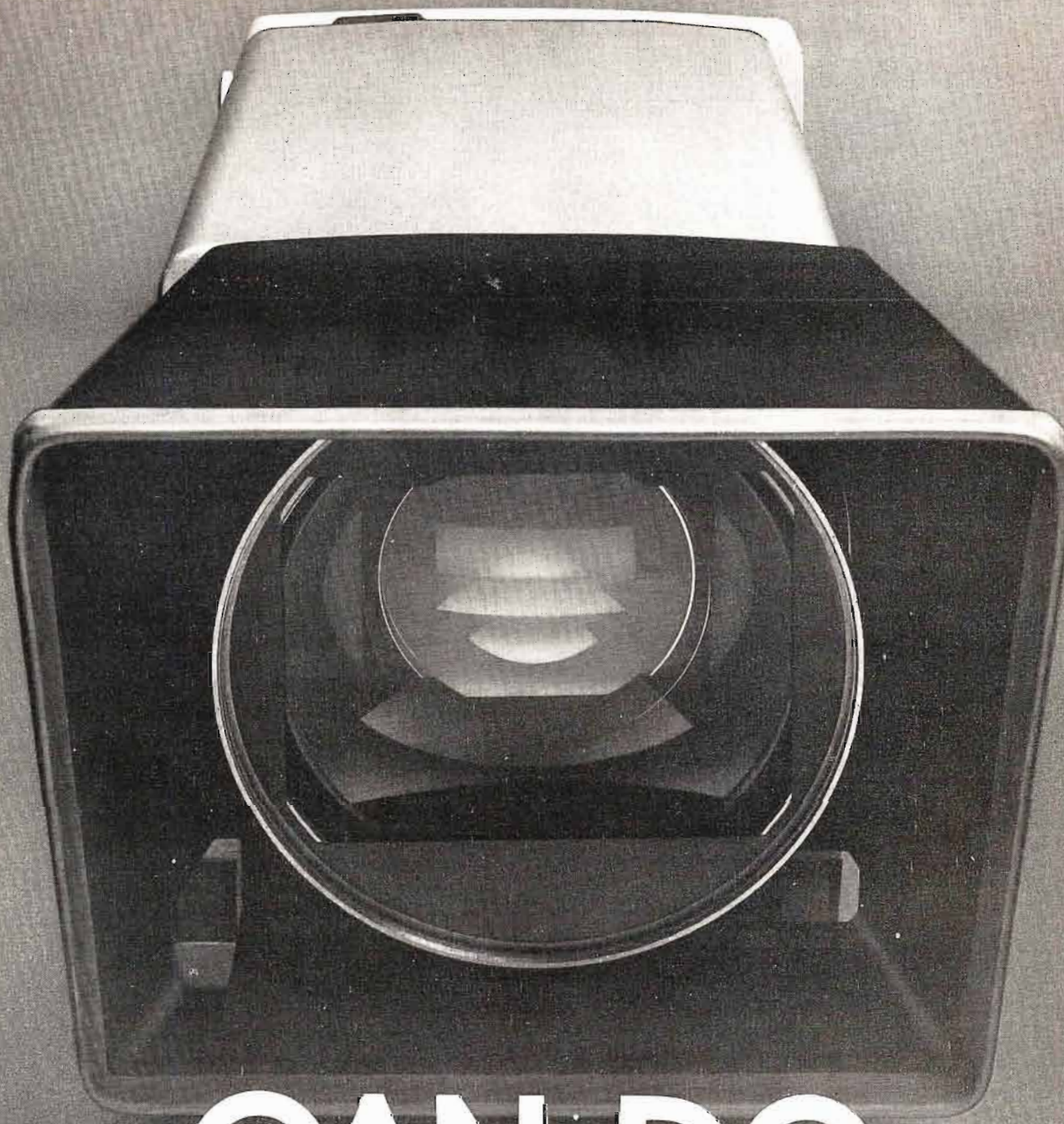

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The operation of ILS was purposely kept simple, because it had to perform complex functions according to the requirements of the production. ILS is designed to communicate in ordinary production language.

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You won't see a large console filled with levers, switches and lights. That's not needed with ILS. Instead, you sit in front of a terminal. In addition to the usual alpha and numeric keys found on these keyboards, we have added our own special function keys.

The CRT displays information you need to know during the show and often you respond to questions asked by the computer. It's a self-teaching system and will not let you enter an incorrect command.

It's an exciting concept in lighting control and we are sure you'll see why when you take command of an ILS Control System.

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Industry news

continued from page 12

N.V. for his paper entitled *Light Sources as an Integral Part of the Color Photographic System,* published in the August 1977 SMPTE *Journal.*

The David Sarnoff Gold Medal award will be presented to Masahiko Morizono, general manager, Sony Corporation's Video Products Division.

The award is for his leadership and engineering achievements in the development of television electronic news gathering equipment, especially in the development of portable helical-scan VTR systems with associated versatile editing capabilities.

Robert E. Gottschalk, president and chief executive officer of Panavision, will be awarded the Progress Medal in recognition of his engineering contributions to the design, development and production of the Panaflex professional motion picture camera, various improved photographic optics and numerous other equipment innovations.

Roderick T. Ryan, Eastman Kodak Company, will receive the Herbert T. Kalmus Memorial Award for his continuing contributions to color film printing and processing systems.

John A. Maurer, retired founder of J. A. Maurer, Incorporated and Optronics, will be awarded the Honorary Membership Award for his seminal contributions to the theory, design and development of 16mm motion picture equipment and related systems.

Four men will receive Special Commendation Awards for 1978. The honorees are:

Julius Barnathan, president, broadcast operations and engineering, American Broadcasting Company, for contributing to engineering progress in all phases of television—broadcasting research, design of equipment and facilities.

Dr. Georges Broussard, director of research, Thomson-CSF, for having pioneered the development of the videodisc system since 1969.

Linwood G. Dunn, president, Film Effects of Hollywood, for his innovations in the creation of special optical effects in motion picture and television production.

David W. Samuelson, director, Samuelson Film Service, Ltd., in recognition of his lifelong achievements as cameraman and producer, who has filmed newsreels and documentaries covering aviation and motor sports in over 40 countries.

Committee studies blanking

An ad-hoc committee of broadcasters has been formed to investigate the complex problems relating to the variations in picture blanking widths throughout the television broadcast industry.

The committee, under the chairmanship of Thomas Keller, director of engineering, WGBH-TV, Boston, is composed of the commercial networks, public television, major group broadcasters, and the NAB.

Specifically, the committee will be examining

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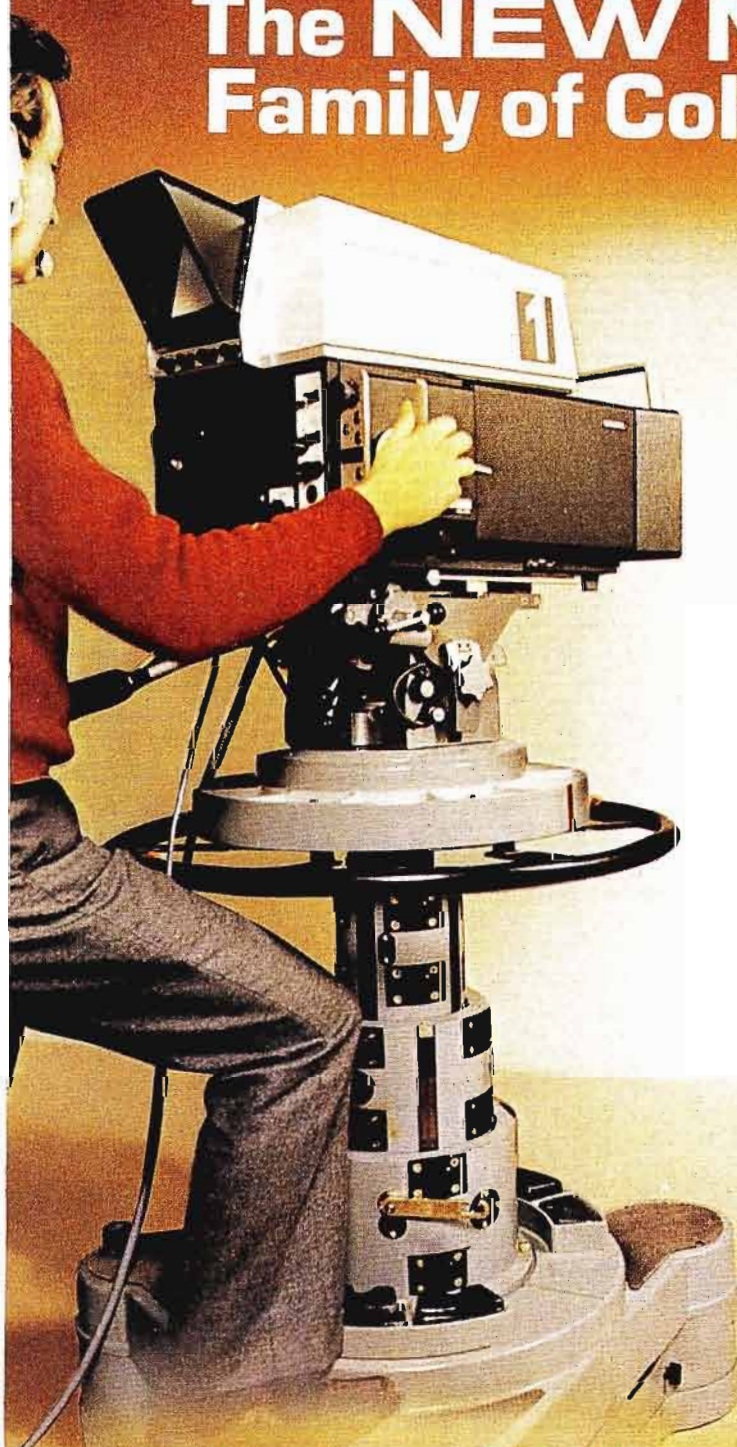

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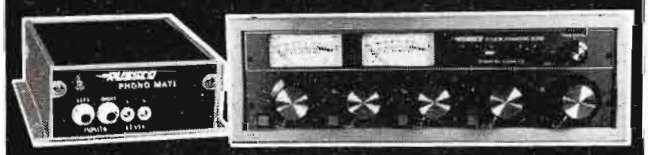

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Industry news

continued from page 14

operating practices throughout the industry, working with manufacturers and industry organizations to identify problem areas and to recommend corrective action.

NAB urges efficient spectrum use

In comments filed with the FCC, the NAB opposed a proposal by Searle Radiographics to permit increased radiation and more spectrum space for transmission of medical data from a hospital room to a central location on unused VHF television channels.

Under present FCC rules, a telemetering device may operate in the 174-216 MHz band, provided that it is used for transmission of biomedical data, emissions are confined to a 200 kHz bandwidth, and the field strength of emissions does not exceed 150 uV/m at 30 meters from the device.

The NAB said it supports technological advances in the medical profession, but "this proposal appears to be yet another illustration of the classic case of using radio spectrum for a small convenience or cost savings when alternative means are available."

Teletext system functioning

KSL-TV, Salt Lake City, has begun broadcasting its teletext signal, the first use in the United States of a teletext information system transmitted over a TV broadcast station.

KSL-TV received permission from the BBC and the FCC to broadcast the ancillary signals on a test basis.

Viewers can select regular programming, the information service or both, using a simple push-button selector. There is no charge for the service.

The information service consists of colored words and graphics printed on the television screen in much the same manner as sports scores are shown now.

The viewer can select from up to 800 "pages" of information which are transmitted sequentially and are constantly updated. The information can be called out at any time the set is tuned to KSL-TV, Channel 5.

Other features of the Teletext System include news bulletins to overprint the picture, six-color graphic display maps and charts, a button to reveal "hidden answers" for educational use, an update button and a time addressing button.

Wireless microphone use

The FCC has warned that the operation of a wireless microphone on an unauthorized frequency makes the user liable for operation of an unlicensed transmitter in violation of Section 301 of the Communications Act of 1934.

Frequencies that may be used for a wireless microphone operating under Part 15 without an individual license include bands 10-490 kHz, 500-16

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- Camera Lens
- Camera Tripods, Dollys, Pedestals
- Cartridges - Tape
- Clocks
- Converters, Power Phase
- Demodulator, TV Video - Demodulator, Aural, Noise Meter
- Diplexers, Combiners - TV (VHF/UHF)
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- EBS Systems
- Filters, Optical; Test Patterns; Test Slides
- FM Isocouplers, Combiners, Diplexers
- Generators, Engine - Emergency Power
- Generators, Sync; Proc. Amps; Video DAs; Terminal Equipment
- Headsets
- Land-Mobile Communications
- Lights, Studio
- Lights, Studio Warning
- Lights, Tower - Light Controls, Isolation Transformers
- Meters, Field Intensity - Phase Monitors - Impedance Bridges
- Microphones
- Microphone, Audio Cable
- Microphone Stands
- Microwave - TV
- Monitors, Picture
- Monitors, Waveform, Vectorscope
- Multiplexers, Optical
- Printers, Loggers, Terminals
- Projectors, Film/Accessories (Television)
- Projectors, Slide/Accessories (Television)
- Rack Cabinets, Tape Storage Cabinets
- Regulators, Primary Power
- Remote Broadcast
- Remote Control
- SCA Receivers
- Speakers, Loud: Baffles/Accessories
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- Switches, Coax - Manual & Motorized
- Switches, Video
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...and what have we done for you lately?

14 years ago we delivered the original 30mm Plumbicon® camera tube that revolutionized TV broadcasting...

9 years ago we introduced the 1-inch Plumbicon tube that permitted the design of more compact broadcast cameras...

4 years ago—the 2/3-inch Plumbicon tube brought broadcast quality to portable cameras and gave us ENG...

Today, we bring you two of these popular pickup tubes with further improvements in performance.

Ever since the original Plumbicon tube won the Emmy Award for having revolutionized color TV broadcasting, we've been keenly aware of the importance of the name Plumbicon to the TV industry which has come to depend on it as it's assurance of consistent performance and quality. There's no disputing the fact that contemporary Plumbicon tubes outperform their original versions by a wide margin.

Two of the most recent improvements in the Plumbicon pickup tube line, (the 30mm XQ1410 and the 2/3-inch XQ1427) are described here. These tubes, like all Plumbicon TV camera tubes, offer unmatched resolution and sensivity, superior color rendition . . . excellent highlight handling . . . low and steady dark current . . . high signal-to-noise ratio . . . minimal lag . . . stable operation over a wide temperature range . . . and long life.

Type XQ1427: Offers significantly higher resolution than earlier versions; modulation depth is 60% typical at 320 TV lines giving sharper, clearer pictures and allowing operation at lower light levels. New gun design and 1500-line mesh construction result in improved registration and geometry, reduction of flare by a factor of 3 and reduced beam landing error.

Type XQ1410: The XQ1410 gained immediate acceptance by the television industry as a significant advance over all previous 30mm tubes. This recognition is based on the XQ1410's dramatic reduction in lag (typically 37% below that of our XQ1020.) The XQ1410 ends color-fringing, greatly reduces picture-smear and gives better dynamic resolution—even under poor lighting conditions. With its internal bias lighting, all three channels can now be balanced for identical lag characteristics. New gun construction gives improved resolution, (60% typical modulation depth at 400 TV lines). New mesh construction results in better geometry and registration and significantly reduces microphony.

Make no mistake—these are vitally important improvements on vitally important camera pickup tubes . . . but these developments are only part of the answer to—"What have we done for you lately?"

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...and now the next generation of Plumbicon TV camera tubes:

with them begins the age of Electronic Cinematography.

"Cinematography" once meant the creation of motion pictures on film, and film alone. But no more.

The next generation of Amperex Plumbicon TV pickup tubes, in combination with recent advances in new camera design and videotaping systems, is destined one day to reduce to near-zero the use of film in broadcast cinematography and in motion picture production. Now, indeed, begins a new era... and a new art form: Electronic Cinematography. All-electronic production will offer a technically superior product, and will permit shorter lead times between production and broadcast... and it allows motion picture directors to combine the creative aspects of single-camera film production with the immediacy of live-on-tape TV techniques.

All this has been no accident, of course. We, for instance, have been working toward this moment for fourteen years, ever since the introduction of the original Plumbicon tube ...right through the advent of ENG, first brought to reality by our 2/3-inch version of the Plumbicon tube.

This steady stream of advances in TV pickup tube technology now culminates in a new generation of Plumbicon tubes that offers major advances in resolution and lag performance... advances that were prerequisite to the dawn of the age of Electronic Cinematography.

Type S45XQ: Developed for use in new studio cameras that will accept 30mm tubes, has limiting resolution of 1600 TV lines, with modulation depth of 95% at 400 TV lines and 40% at 1000 TV lines. Nothing like it has ever been offered in a broadcast quality tube. The S45XQ provides for external bias lighting; but decay lag, even without bias light, is typically only 7% after 50 milliseconds.

Type S73XQ: Physically interchangeable with conventional 1-inch broadcast Plumbicon tubes, can be used in existing studio and field production cameras with only minor circuit modifications. Typical limiting resolution of the S73XQ is 1000 TV lines, with modulaton depth of 65% at 400 TV lines. Overall signal-to-noise ratio can be maximized in the S73XQ by a low-capacitance target contact. A revolutionary gun design in the S73XQ reduces lag; decay lag is typically 2% at 50 msec. with bias lighting.

Both of these new-generation tubes inherit all the finer qualities of the original Plumbicon pickup tube: near-zero dark current... high sensitivity... resistance to burn-in, even in highlights... precise geometry and registration... and long life. You can expect from them what you have learned to expect from Amperex Plumbicon tubes; performance at the edge of tomorrow.

For more information, contact: Amperex Electronic Corporation, Slatersville Division, Slatersville, Rhode Island 02876. Telephone: 401-762-3800.

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continued from page 16

kHz, 26.97-27.27 MHz, 49.82-49.90 MHz, and 88-108 MHz.

A wireless microphone that operates on any other frequency must be licensed.

Limitations on aural licenses

(Open letter to **Broadcast Engineering** readers)

One thing that we have noticed in our travels around the country on inspection tours is the apparent lack of understanding of Part 74 in regards to the licensing of aural (900MC) STLs. As you know, aural STLs or studio-to-transmitter links provide clean, reliable service between the studio transmitter at many broadcast facilities. They are applied for and licensed by the FCC, use low power transmitters and highly directional antenna systems.

It is a simple procedure to apply for and receive a license, buy a transmitter, two antennae and a receiver (contact your consultant for details) set it up and go. What more could the average chief want? Redundancy of course! Thus, many chiefs wrote the manufacturer of their original rig and ordered the identical system again, installed it, and now sit content with two transmitters, two receivers, four antennae and one license. Right? Wrong!

Contrary to what 74.4511 (Part A-1) might indicate, 74.551 Equipment Changes stipulates the following (in part):

(a) Prior Commission approval, upon appropriate application (FCC Form 313), therefore, is required for any of the following changes:

(1) A change in the transmitter as a whole (except replacement with an identical transmitter), or a change in power output.

The use of an identical system as a backup does not obviate the need for an alternate main or auxiliary license at any STL or RPU installation, aural or visual. Thus, the possibility of citation for operating an unlicensed transmitter (a fairly serious gig) might be just as close as your STL rack. Send a Form 313 in for that alternate or auxiliary-transmitter; it won't hurt your piece of mind.

Paul Flint
Engineering Department
Frazier, Gross & Clay

NAB stand on format change policy

In a brief filed on behalf of the FCC, the NAB told the U.S. Court of Appeals for the District of Columbia Circuit that radio format changes should

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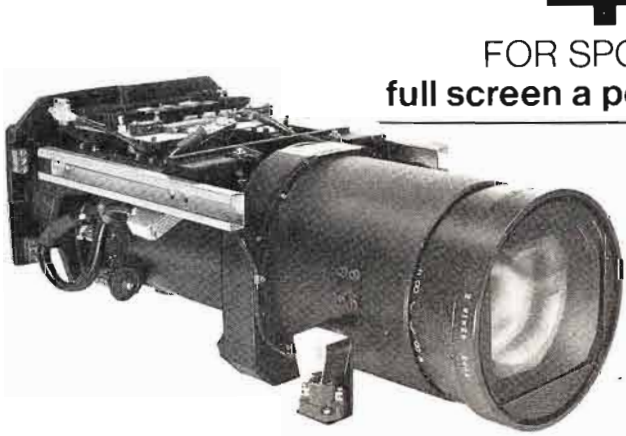

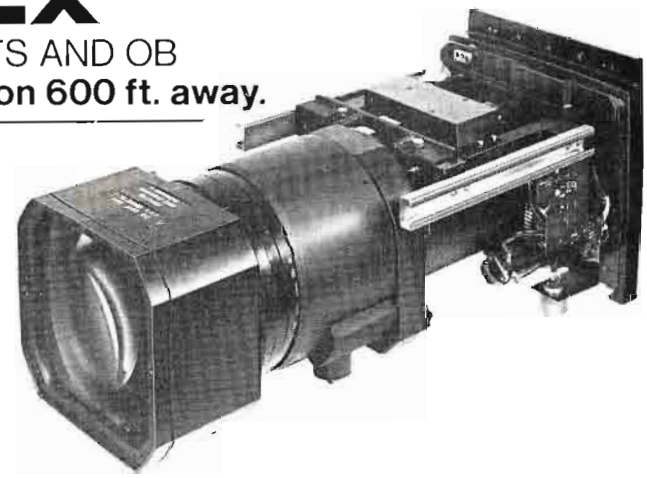

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meetings, events&seminars

October 17-19—*Video Expo/New York*, the largest professional video exposition, will be held in the Rotunda and Felt Forum of New York's Madison Square Garden. The conference, sponsored by Knowledge Industry Publications is designed to provide users with guidelines for effective video communications.

Registration for Video Expo/New York is $4.00 by advance mail and $5.00 at the door.

For more information, contact: Sheila Frank, Dept. BE, Knowledge Industry Publications, 2 Corporate Park Drive, White Plains, NY 10604.

October 19-21—The Distributor Products Division of the *Electronic Industries Association* will hold its 1978 annual meeting at Del Webb's Newporter Inn, Newport Beach, CA. The program will feature two morning seminars followed by organized recreation. Each day's activities will conclude with a reception and banquet for all participants.

For more information, contact: EIA/DPD, Dept. BE, 2001 Eye Street, N.W., Washington, D.C. 20006.

October 20-21—The *1978 Film and Video Tape Seminar* will be held at the Marriott O'Hare in Chicago.

Topics to be discussed range from animation and special effects to multi-image presentations. Two keynote speakers will be featured, one to mark the opening of the seminar on Friday evening, and one to close the event on Saturday afternoon.

For more information, contact: Bennett Grossman, Dept. BE, c/o Edit/Chicago, Prudential Plaza Suite 3010, Chicago, IL 60601, (312) 787-9100.

October 24-27—A four-day course, entitled Data Communications: Digital Techniques and System Design, will be offered by *Integrated Computer Systems* in New York. The course is designed for engineers, scientists and system designers who are involved in the planning, design or implementation of all types of digital communications systems.

It will be offered also in Boston, November 14-17; Los Angeles, December 12-15; Dallas, January 23-26; Chicago, February 6-9 and Washington, D.C., March 13-16.

For more information, contact: Kim D. Sanson,

continued on page 24

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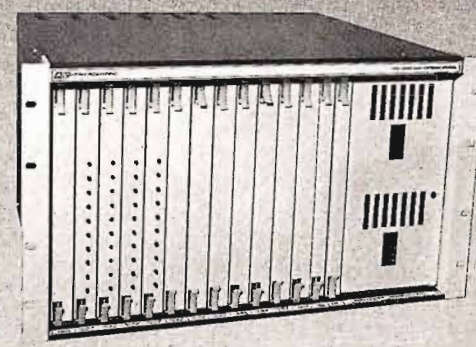

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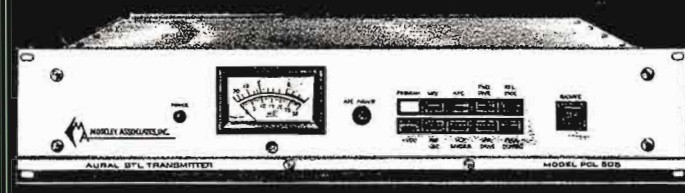
NEW! FROM MOSELEY ASSOCIATES!

Model MRC-1 Microprocessor Remote Control

From Moseley Associates — the proven leader in broadcast transmitter remote control — now the technology of microprocessor-based systems! The Model MRC-1 Microprocessor Remote Control System offers 32 channels of programmable control, telemetry and status. Standard features include: Keyboard calibration of linear and power-log scale parameters; random assignment of control; telemetry and status channel mixes; momentary or latching control and status functions; full limits checking and aural alarm. Automatic logging is also available.

Model PCL-505 Aural Studio-Transmitter Link "THE STL"



Moseley brings you uncompromising performance for FM quadraphonic, FM stereo, AM stereo and monaural services. Standard features include all solid-state construction with on-frequency final RF amplification in all frequency bands. *Wideband composite or discrete channel systems — both Moseley firsts!* Models PCL-505/C, PCL-505 and PCL-101 provide extensive multimetering and serviceability. Models TPT-2 and TPR-2 Automatic Transfer Panels afford complete standby redundancy. A complete line of proven accessories and antenna systems is also available.

Model TFL-280 Audio Limiter FM Loudness and Clarity

Get loudness and clarity without compromise! FM monaural, stereo, quadraphonic, FM SCA, TV aural are all expertly processed. This frequency-conscious limiter cleanly solves the problems associated with the transmission of pre-emphasized audio, including the ringing (overmodulation) produced by low-pass audio filters. A combination of the Model TFL-280 Audio Limiter; SCG-9 Stereo Generator; and PCL-505C Composite Aural Studio-Transmitter Link provides maximum modulation capability with clarity for the remote FM stereo broadcast operator.

OTHER MOSELEY SYSTEMS

Model TRC-15A Analog Remote Control System. Provides 15 analog telemetry channels and 30 control functions. Allows subaudible (20-30 Hz) telemetry return for simultaneous AM and programmed FM SCA broadcast carrier telemetry return.

Models TCS-1 and TCS-2 Telecontrol Systems. Eight control, status and telemetry channels packaged for efficient and reliable operation. Two TCS-1 and/or TCS-2 systems can be stacked over a common 3 kHz interconnect circuit.

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Meetings, events & seminars

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program manager, Integrated Computer Systems, Dept. BE, 3304 Pico Boulevard, P.O. Box 5339, Santa Monica, CA 90405.

October 25-26—The 11th Annual Connector Symposium, under the direction of the *Electronic Connector Study Group*, will be held at the Cherry Hill Hyatt House in Cherry Hill, New Jersey. Engineers and scientists concerned with electrical connectors and interconnections will present results of their technical investigations, new developments and technology to representatives of connector users and manufacturers.

Topics to be covered include leadless packaging, printed wiring/backpanel connector systems, contact theory and design, EMC/EMP/coax connectors, fiber optics, and cabling cable connectors.

The $25 registration fee covers admission to 40 technical sessions, a copy of the proceedings, a copy of the Index of the Electronic Connector Study Group papers, two lunches, a cocktail party and a banquet.

For more information, contact: Electronic Connector Study Group, Dept. BE, Box 1428, Camden, NJ 08101.

October 29-November 2—The 120th Technical Conference and Equipment Exhibit of the *Society of Motion Picture and Television Engineers* (*SMPTE*) will be held at the Americana Hotel in New York City.

The conference will feature four days of presentations of different aspects of motion-picture and television technology. The television subjects include satellites, video processing, video production, video transfers and video special effects and editing.

The exhibit will feature leading manufacturers and suppliers of television equipment. More than 6000 film and television professionals are expected to attend.

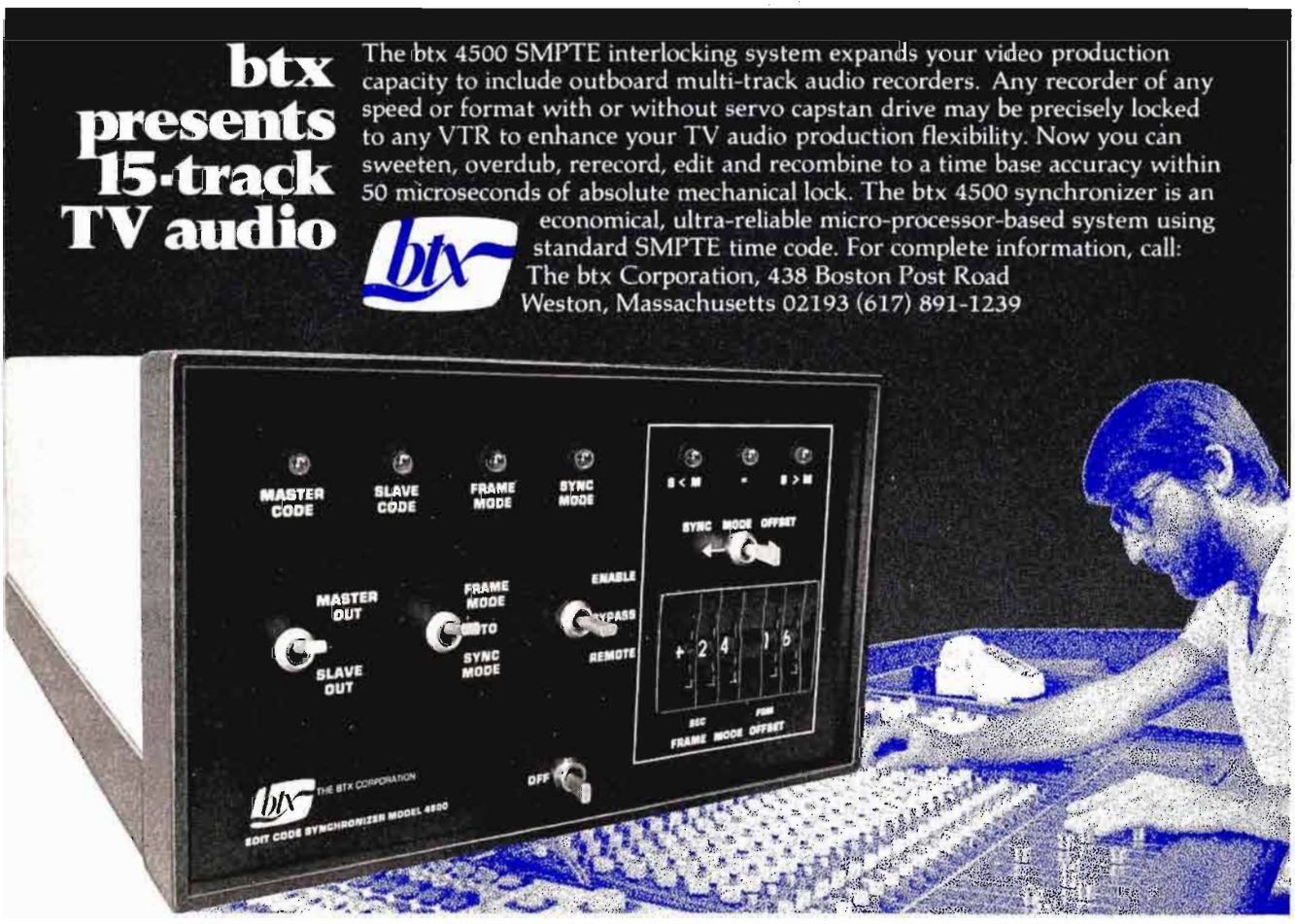
For more information, contact: Irwin Young, Dept. BE, SMPTE, 862 Scarsdale Avenue, Scarsdale, NY 10583, (914) 472-6606.

October 29-November 2—The *1978 NAEB Convention* will be held in Washington, D.C. This year's convention features equipment theme shows, demonstrations, hospitality suites, and a video fair.

The video fair will feature the largest exhibition of video software ever assembled for public broadcasting. NAEB anticipates over 50 small theater areas for program preview.

Separate meeting rooms will house software and hardware theme shows featuring textbook publishers for broadcast education sessions; microphone manufacturers for radio engineering seminars and portable video equipment for producers, among others.

For more information, contact: NAEB, Dept. BE, 1346 Connecticut Avenue, N.W., Washington, D.C. 20036. □



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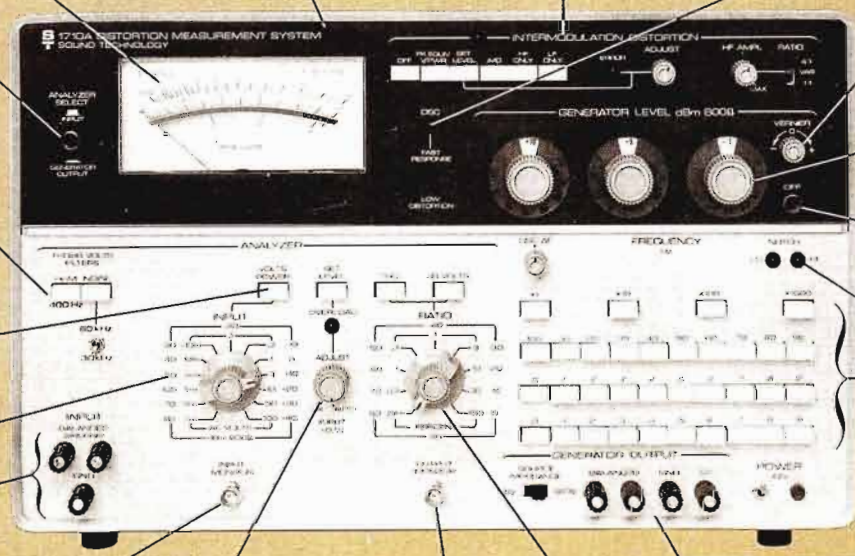
Here's how useful a distortion analyzer can be



Monitor voltage, power, distortion or dB ratio.

No manual nulling controls required (the 1710A is always in auto-null, reaches a null in less than 5 seconds).

Intermodulation Distortion Analyzer optionally available.

Oscillator distortion is typically .001%.

Measure generator signal at load with the push of a button.

±1 dB Vernier adds fine level control.

Internal oscillator adjustable from +26 dBm to −89.9 dBm in 0.1 dB steps.

Selectable 18 dB per octave filters reject hum and high frequency noise.

Turn off oscillator for quick S/N measurement.

Fast pushbutton operation lets you set level, measure voltage or power, then measure distortion.

Tuning indicators help measure distortion of an external source.

Measure voltage or power from 10 Hz to 110 kHz.

Simultaneously select oscillator and analyzer frequency with fast-to-use pushbuttons. 10 Hz to 110 kHz.

100 kΩ Balanced Input.

Balanced and floating 150Ω or 600Ω Generator output.

View input signal on a scope.

Automatic Set Level is optionally available.

View distortion products on a scope.

Measure distortion down to .002%, voltage or S/N ratios with 100 dB dynamic range.

Two of the above features are so outstandingly valuable that we especially invite your attention to them.

One is the fast, easy measuring you get with pushbutton-selected distortion-measuring circuits (signal source and measuring circuits are simultaneously selected with the **same** pushbuttons). Pushbuttons make it so simple to measure quickly and to repeat measurements.

Secondly, you can drive virtually any type of circuit from the signal source output — whether balanced, unbalanced, off-ground or whatever. That's because the signal source output *circuit* is fully **isolated and balanced.**

There is no output transformer to introduce noise or distortion.

Besides these outstanding conveniences, you can have the Sound Tech 1710A with an option that enables you to measure **intermodulation distortion.**

Call Mike Hogue/Larry Maguire to get full information on an instrument recognized everywhere as the standard of the audio field.

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Hitachi makes major SK-80 sale

The largest single camera order in the history of Hitachi Denshi America was made recently to Corinthian Broadcasting Corporation, a subsidiary of Dun and Bradstreet.

Corinthian purchased 36 Hitachi SK-80 broadcast color cameras, bringing the total to 51 Hitachi SK-80's owned by the corporation. The self-contained cameras are used for ENG and EFP applications in the news and production departments of the group's five TV outlets and the TVS Television Network.

RCA announces sell

London Weekend Television, which produces programs for the independent television network in the United Kingdom, is expanding its production and post-production capabilities with RCA videotape recorders and editing systems valued at more than $800,000.

Seven TR-600 quadruplex videotape recorders will be installed in the company's production center, Kent House in London. The machines will be equipped with RCA AE-600 built-in editing systems for editing tape. The new recorders will join RCA TR-70 machines that have been in service since 1969.

Sony telephone hot line

In order to provide owners of Sony professional equipment with quick, accurate parts and servicing information, Sony Corporation of America has established a 24-hour, seven-day-a-week telephone hot line.

It enables owners of professional video equipment to get immediate answers to technical questions, order emergency parts, find out about the latest Sony training classes and order technical manuals.

Hot line numbers are: eastern region (New York) (212) 361-0014, central region (Chicago) (312) 647-9596, western region (Los Angeles) (213) 635-6322.

Nurad enters new area

Nurad has entered the microwave TV systems business. Chiefly because of new capabilities provided by the services of Vincent Rocco, formerly of CBS, Nurad can design, supply and install complete microwave systems for TV broadcasters.

Rocco, director of microwave television systems, joined Nurad in March of this year with 30 years of experience in RF communications, the past 15 of which he served as director of relay systems for CBS. His achievements at CBS (including the design of TV systems to cover the NASA launches and astronauts'

continued on page 28

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Last year, 42 U.S. broadcasters made the biggest decisions of their careers. And the smartest.

They chose RCA TV transmitters.

Purchasing a TV transmitter is probably one of the biggest single equipment decisions you'll ever make!

We know it. You know it.

But the real measure of any transmitter investment isn't how much you spend. It's what you get for your dollar.

In a word, it's value. Value that translates into performance. Long-term, reliable, trouble-free performance.

It's what's inside a transmitter that counts.

And in some cases, what's left out is just as important.

Inside RCA transmitters, for example, you'll find fewer tubes, fewer blowers, fewer linear amplifiers.

But you'll find more solid state circuitry, and more features that increase reliability and decrease the need for adjustments.

In part, these features explain why year after year, more U.S. broadcasters choose RCA TV transmitters than any other.

And it's who's behind a transmitter that counts.

A transmitter is a long-term investment.

And the longer the term, the better.

With RCA Tech Alert support, you get technical information and assistance any time around the clock.

RCA's staff of field experts service RCA transmitters world-wide. And there is real comfort in the knowledge that parts will be available from RCA whenever, wherever, you need them.

Which is one more reason why, today, there are more RCA TV transmitters out there performing than any other brand.

Cost-effectiveness was never clearer.

Consider your initial investment, repair and service costs, and length of operating service. Then decide on RCA.

RCA TV transmitters and RCA service have been providing reliable performance—and long-term cost-effectiveness—for many years.

Find out for yourself what RCA quality can mean to you. Contact your RCA Representative or write directly to us. RCA Broadcast Systems, Front & Cooper Streets, Bldg. 2-2, Camden, NJ 08102.

We sell more TV transmitters in the U.S. than anybody else. With more in operation than anybody else. Now, you know some of the reasons why.

RCA

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Watch what we can do for you now...

with our new models and our faster delivery.

As manufacturers of solid state video equipment, Electrohome has gained worldwide acceptance with reliable, high-performance 9″, 11″, 14″, 17″, 23″ monochrome, 19″ and 25″ color monitors. Built to NTSC and PAL standards, these monitors are specifically designed for broadcast, educational, industrial, commercial, medical, security and data applications.

Now, we have added the new 2000 Series to our product range. Developed to meet high standards of the broadcast industry, the 2000 Series color monitor is modular for easy adaptability to RGB/NTSC/PAL encoded signals. Available in 19″ case and rack and 25″ case, the 2000 Series maintains Electrohome's high standard of engineering.

In addition to an expanded line, Electrohome has a new west coast distributor network to provide fast delivery. For complete information on all our video equipment, contact Electrohome Limited at one of these offices:

Electro-Visual Corporation of America
3617 West Macarthur Blvd., Suite 508, Santa Ana, Calif. 92704
(714) 545-6991

Electrohome (U.S.A.) Limited
182 Wales Ave., Tonawanda, N.Y. 14150
(716) 694-3332

Electrohome Limited
809 Wellington St. N., Kitchener, Ontario, Canada N2G 4J6
(519) 744-7111
Telex: 069-5449

ELECTROHOME

. . . an extra degree of excellence in video equipment for every application.

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splash-downs, the freedom marchers' activities and CBS sports events from the Goodyear blimp) provide the base from which Nurad can help in overall broadcast systems planning and design as well as contract for producing turnkey microwave TV systems.

Video imports up

First quarter 1978 imports of audio and video electronics products totaled $938 million, a 9% increase over first quarter 1977, but less than the previous year-to-year first quarter growth of 32%. Videotape machine imports increased to 40% in quantity and 159% in value to $65.1 million. Monochrome TV imports increased 15% in quantity; tape recorders/players, phonographs, and auto radios each increased by less than 4%.

Iran orders transmitters

Harris Corporation's broadcast products division has received a $6.75 million order from Iran's national broadcasting system for 144 FM radio transmitters.

The transmitters will be installed at 24 different sites by the National Iranian Radio and Television agency to provide FM radio reception throughout the country.

Overseas appointment

The electronics division of Singer Products Company has been appointed export marketing distributors of Blonder-Tongue Laboratories, designers and manufacturers of products for the reception enhancement of all types of TV systems.

In addition to Blonder-Tongue, the Singer Products Electronics Division represents manufacturers of electronic components, instruments and test equipment for DC through microwave frequencies for commercial, industrial, military and aerospace applications; audio and TV entertainment products; security systems; and wire and cable.

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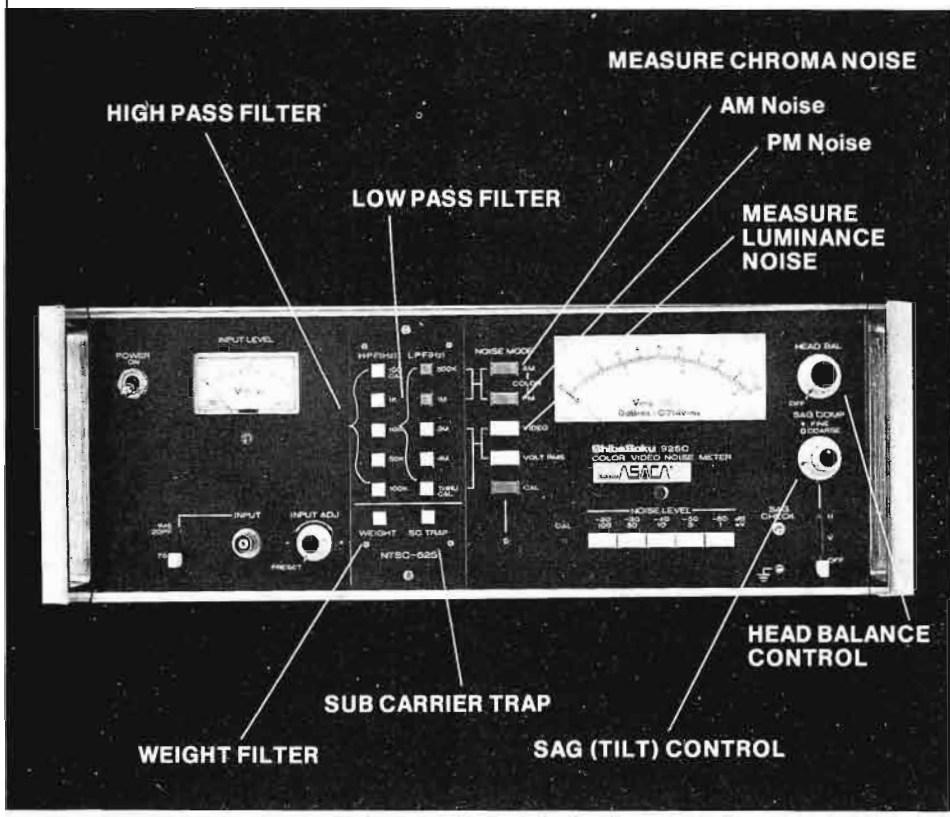
MEASURES CHROMA NOISE AND LUMINANCE NOISE



World's first Instrument to Measure Chroma Noise Generated In Color and Black and White Television Transmission Equipment, TV Cameras, VTRs, Video Disc Units, Digital Image Processors.

Measure the value of this unique instrument*, Model 925C Video Noise Meter, and you'll see why it has been purchased by a major USA network. It measures chrome band noise with a single color signal of desired level that contains both a sync signal and a color burst signal. Chroma noise can even be split into AM and PM components which can be measured separately. Unbalanced 2 head of VTR can be corrected for proper measurement.

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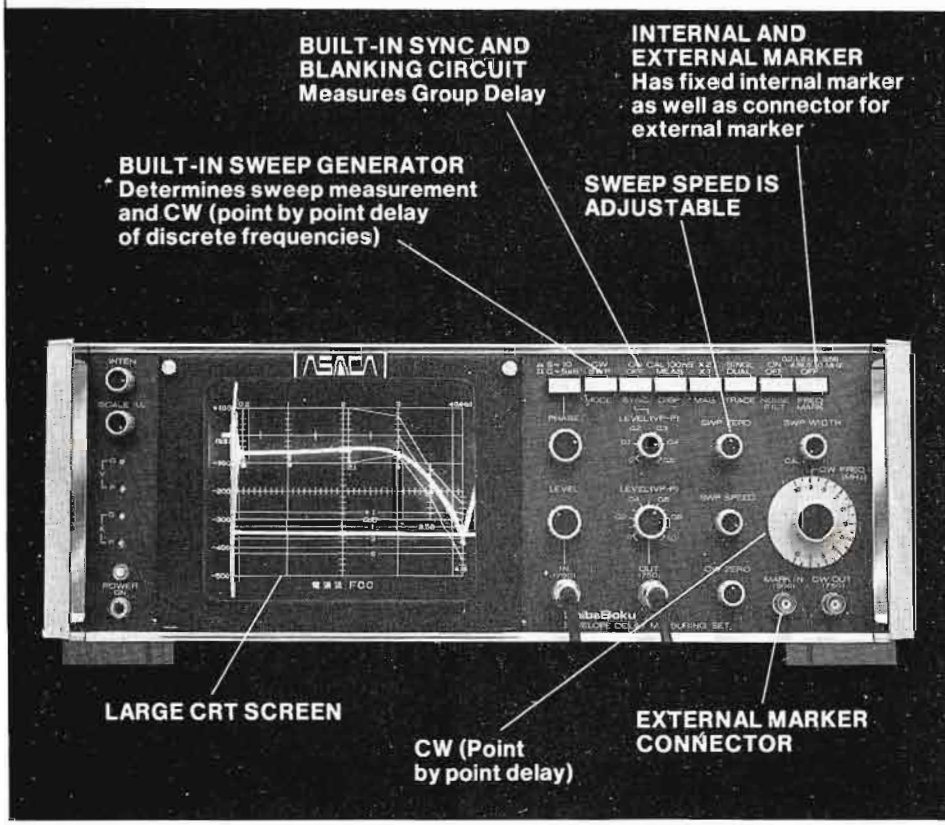

At last! The Envelope Delay Measuring Set You've Always Wanted—But Which Technology Couldn't Develop Until now! Compare Performance With Equipment Selling For $14,000.00. Our Price—Only $6,500.00!

Our envelope Delay Measuring Instruments* feature large CRT screens, built-in sweep generators and allow spot frequency delay measurements from 200 KHz to 10 MHz. Check out Models 763 NA and the new 201-1. Both are NTSC or PAL compatible. The 201-1 adds a built-in sync generator and blanking mixer.

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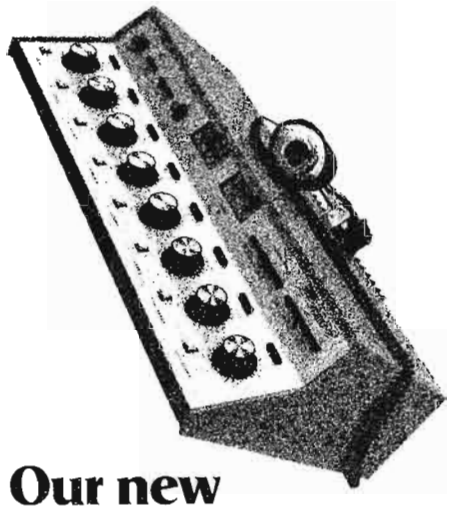

Our new stereo console does everything but cost like one.

It's the new Rockwell-Collins Mark 8 Stereo Console. You get outstanding performance at about half the cost of many ten-channel models.

Mark 8 features all plug-in construction, including switches, PC boards, attenuators and amplifiers. Plus a host of maintenance aids.

Additional features? Performance that equals consoles costing several times as much. 22 dB of head room. ±1-dB frequency response. ¼% harmonic and intermod distortion. Big 25-W monitor amps. 5-W headphone amps. Optional machine control functions for ease of operation.

The remarkable new Mark 8 Stereo Console. It looks like we just priced ourselves right into your radio station. Contact your local Rockwell-Collins man. Or Collins Broadcast Marketing, Commercial Telecommunications Group, Rockwell International, Dallas, Texas 75207. Phone 214/996-5574 or 5424.

Rockwell International

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Business news

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ADC sells system

American Data Corporation has announced the sale of a multi-stage audio and video distribution switching system to the Christian Broadcasting Network in Virginia Beach, Virginia.

The 900 system, the largest ever built by the company, will employ three stage switching techniques utilizing a micro-processor based computer control interface. A CRT terminal will provide intermediate X/Y switching and maintenance control for the video and dual audio channels, along with command status monitoring for all stages.

New Farinon group

Farinon Corporation announced the formation of the Farinon Transmission Group. The group combines Farinon Electric, Farinon Video and Farinon Satellite Systems.

Edward E. Nolan and Thomas A. Combellick will become the group vice presidents. Nolan, who is a director and executive vice president will also assume the presidency of the Farinon Satellite Systems Division of the transmission group.

Rockwell retirement

W. F. Rockwell, Jr., chairman of the board of Rockwell International Corporation announced his intention to retire as an officer of the company next April.

He will continue as a director and as chairman until February, 1980. It is expected he will be succeeded as chairman by Robert Anderson, president and chief executive officer.

IVC Malaysia contract

International Video Corporation has been awarded a contract by the ministry of information of Malaysia to supply six studio color cameras, IVC7000, and two handheld broadcast cameras, IVC7000P.

The IVC color cameras are part of Malaysia's colorization project. The eight cameras will be used in two outside broadcast vans.

RCA expands service

RCA American Communications announced that its earth station near Atlanta will be expanded to offer private line services between the southeast and other parts of the country by mid-year 1979.

The station is located less than 10 miles from the downtown business district. The central office will be co-located with the communications terminal and will become a key link in RCA Americom's network now serving major U.S. business centers via satellite.

Burwen name change

The tradename used on all Burwen products will be changed to KLH Burwen Research. Scott L. Davis, president of KLH Research and Development Corporation announced the change as part of the plan to integrate Burwen Research, KLH's subsidiary, into its overall marketing efforts.

Thailand orders LDK 5's

The Thailand government controlled television network has placed an order with Pye TVT for two LDK 5 color television cameras.

In addition to the cameras, three LDK 4210 signal processing amplifiers have been ordered for use in OB vehicles.

Dolby adds stations

Dolby Laboratories has announced that three additional FM stations have begun full time broadcasting with the Dolby FM process.

WCRB, Waltham, is the Boston area's commercial classical station, while WBUR, operated by Boston University, broadcasts a varied classical jazz format. KUSC, operated by the University of Southern California, broadcasts a mostly classical format.

Gaylord re-equips

Gaylord Broadcasting Company has announced the purchase of 26 new Philips color TV cameras from Philips Broadcast Equipment

continued on page 32

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We interrupt this magazine to bring you all you need in broadcast equipment.

One call is all it takes to get anything and everything you need in broadcast equipment — from turntables to AM and FM transmitters.

Choose from Rockwell-Collins equipment plus that of close to a hundred different manufacturers. It's one-stop shopping with fourfold advantages:

1. Quality products. Our transmitters and consoles are the result of our technical excellence and single-minded dedication exclusively to the radio broadcaster for over 40 years. We've never once deviated from our goal: to make our name synonymous with quality, reliability and long life . . . for your benefit.

2. Broad choice of products. In addition to our own Generation 4™ FM transmitters and our all-new Power Rock 5-kW AM transmitters (the cleanest, brightest, loudest AM in town), we carry products from the largest team of respected specialty vendors available anywhere from a single source — from ADC to UREI, with nearly a hundred other such leaders in between. If we don't have what you want, chances are we can get it for you. Fast.

3. Flexible financing arrangements. If it's under $1000, you can use your own or your company's Master Charge. For larger orders, take your choice of time-purchase (up to 5 years) or lease plans.

4. Unbeatable customer support. Your emergency is our emergency. We're ready to respond — without delay — 24 hours a day, 365 days a year.

See the cities listed below for the representative nearest you — and call him for one-stop shopping, Rockwell-Collins style. Ask him for a copy of our new brochure, or contact: Collins Broadcast Marketing, Commercial Telecommunications Group, Rockwell International, Dallas, Texas 75207. Phone: 214/996-5424.

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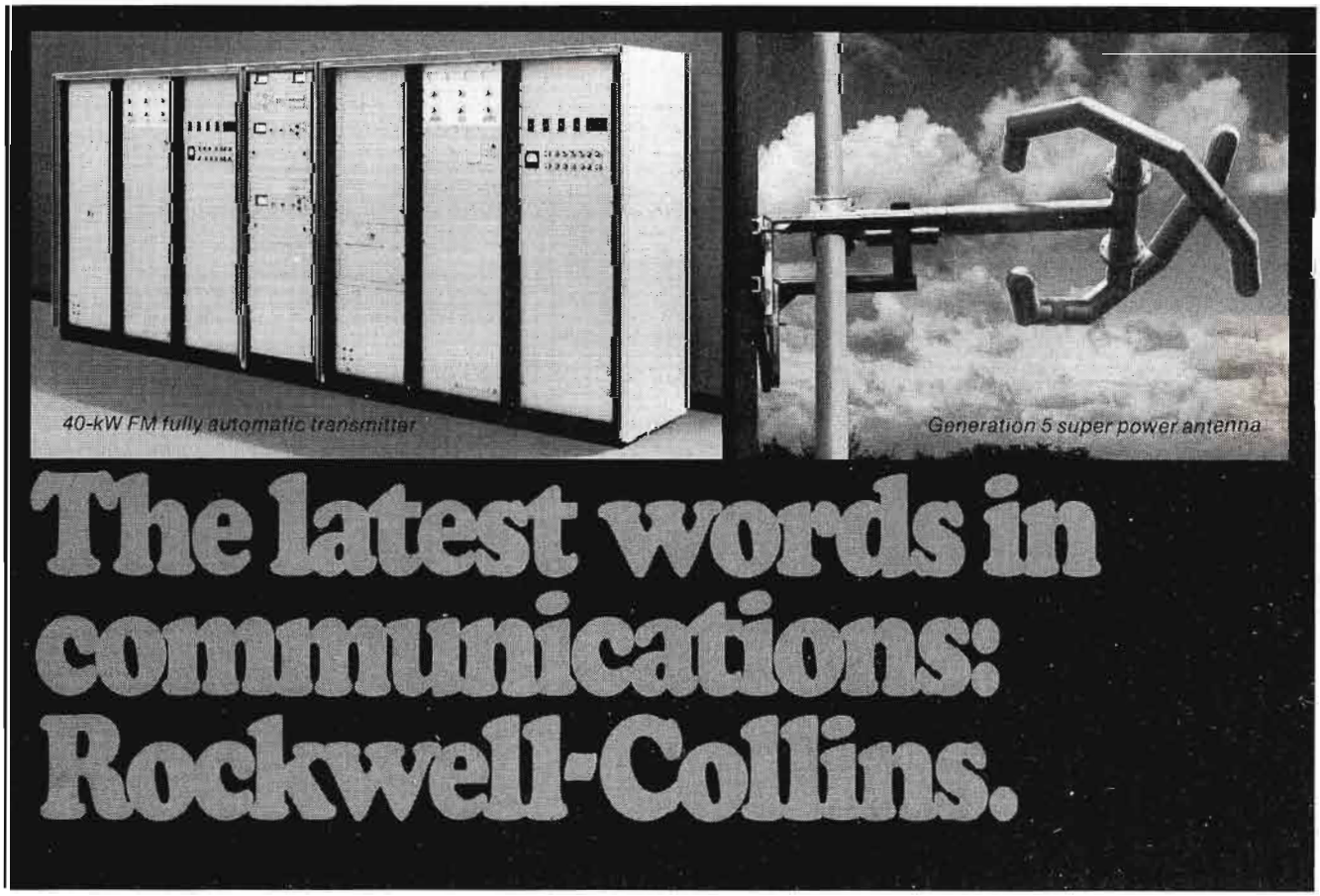

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Tokyo 478-1278 or 478-1279 • Toronto (416) 252-3761

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Corporation. The sale of 18 LDK-25 studio cameras, four LDK-15L production portable and studio cameras, and four LDK-14 ENG/EFP cameras is in excess of $2 million.

Gaylord Broadcasting Company is headquartered in Oklahoma City, and has seven television stations and five radio stations in major markets throughout the country.

Olympic satellite service

COMSAT has signed an agreement with the European Broadcasting Union (EBU) to provide direct satellite services to the EBU for European television coverage of the Winter Olympic Games in Lake Placid, New York from February 6 through 25, 1980.

Under the agreement, COMSAT will install and operate an earth station near Lake Placid. EBU's television signals will be sent through the COMSAT earth station directly to an INTELSAT satellite over the Atlantic Ocean for reception at European earth stations designated by the EBU.

Outlet acquires station

Outlet Company closed its acquisition of radio station KIQQ-FM, Los Angeles, August 1, 1978. The station, also known as K-100, will retain its present music format, which is directed at a young adult audience. The station will be operated as part of Outlet Company's broadcasting division.

Outlet Company agreed January 3, 1978, to purchase the independent station from Cosmic Communications for $4.5 million.

TV facilities upgraded

Nationwide Communications is upgrading the technical facilities of its three television stations with RCA studio and transmitting equipment valued at approximately $1.2 million. Two TV transmitters, a new broadcast antenna tower and associated equipment are included in the order, along with a TK-76 portable camera.

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A new 785-foot tower for WXEX-TV will be erected at the present antenna site of WCVE-TV, Richmond. The new tower facility will accommodate the broadcast antennas for WXEX-TV, WCVE-TV and WCVW.

Ampex price increase

Ampex Corporation has raised prices 7% to 8% on most professional and industrial magnetic tape products. Instrumentation tape prices, which were increased 8% in June, were not increased again. The company's new magnetic media business products as well as its ½-inch Betaformat videocassettes remain unaffected by the general increase.

Earth stations

Construction to install 10-meter satellite earth receiving dishes in Atlanta (WANX-TV), Dallas (KXTX-TV) and Boston (WXNE-TV) through Continental Satellite Corporation, a subsidiary of the Christian Broadcasting Network, has begun.

The earth stations are expected to be in full operation by October 1.

RCA price increases

RCA Broadcast Systems has announced price increases. Averaging 8.1%, the increase affects all RCA-manufactured radio and television broadcast equipment.

Harris reports gains

Harris Corporation reports earnings gain of 30% in the fiscal year ended June 30. Sales increased 35% over fiscal 1977. Net earnings totaled $52,169,000 or $4.22 per share and sales totaled $872,249,000, compared with $646,268,000 and net earnings of $40,059,000 or $3.26 per share the year before.

Comsat quarter report

Communications Satellite Corporation reports a net income of $7,742,000 for the second quarter of 1978, or 97 cents per share. This compares with the net income of $7,968,000 for the second quarter of 1977, or 80 cents per share. □

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How to get TV station quality even if you're not a TV station.

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Introducing the Panasonic AK-920.

There are many ways of getting TV station quality from a Plumbicon® color camera. You can either own a TV station. Own a lot of money. Or better yet, own Panasonic's new Plumbicon color camera, the AK-920.

Not only does it give you TV station quality in the studio, it gives you TV station quality almost everywhere else. That's because it's fully self-contained, with the YI/Q encoder and the RS-170 sync generator built into the camera head.

But perhaps the best part about the AK-920 is the technology that has been put into it. Like a new color-trap circuit in the encoder and level-dependent circuit for reduced color noise, which is particularly important under low-light conditions. And for excellent edge detail and high frequency response, there's an adjustable horizontal aperture circuit built into the camera head.

And since the AK-920 is a Plumbicon camera, you get performance that's hard to beat. Like low noise, low dark current and lag, high sensitivity, as well as the capability to reproduce high brightness details without burn-in or blooming.

The result of all this very impressive technology is equally impressive performance. Like horizontal resolution of more than 500 lines at center. A S/N ratio of 48 dB with recommended illumination of 150 footcandles at F/4. And a + 6 dB gain switch for minimum illumination of just 15 footcandles at F/1.8.

You also get precise stability of alignment as well as the reliability that you expect from Panasonic. Because the prismatic optical system, the three one-inch pickup tubes, and the deflection coils are mounted on an aluminum die-cast chassis.

Also included are removable camera head side panels for easy maintenance. A self-contained, multi-function viewfinder. Color bar generator. And focus-wobble and saw-tooth-generator test circuits. Plus some rather impressive options. Starting with the AK-9220 remote control unit. To a 10:1 zoom lens with built-in 1.67X and 2.5X lens extenders for versatility in location shooting. To a vertical aperture corrector, AK-9620. To the AK-9720 cable equalizer for the RBG signals.

There are also three different versions to choose from. The AK-920ST with studio-grade Plumbicon tubes. The AK-920IT with industrial grade Plumbicon tubes. And the AK-920 without tubes.

So before you buy any color camera, audition the AK-920. It's Panasonic's way of giving you TV station quality, even if you're not a TV station.

For more information, write: Panasonic Company, Video Systems Division, One Panasonic Way, Secaucus, N.J. 07094.

In Canada, contact Panasonic Video Systems Department, 40 Ronson Drive, Rexdale, Ontario M9W 1B5.

Plumbicon is a registered trademark of N.V. Philips' of Holland for TV camera tubes.

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people in the news

Radio/Television

John B. Frykman has been named vice president of network communications by the Mutual Broadcasting System. A veteran of 30 years in advertising, Frykman joined Mutual in December of 1977.

New western regional manager for station relations of the Mutual Broadcasting System is **Richard T. Wartell**. Before joining Mutual, Wartell was a regional manager of the National Association of Broadcasters.

Frank J. Murphy III has been promoted from director of station relations to vice president of station relations for the Mutual Broadcasting System. Murphy will be responsible for both MBS and Mutual Southwest Radio Network station relations.

Frederick J. Moore has been appointed chief engineer for both WNEW and WNEW-FM in New York. Moore was chief engineer at WWSH in Philadelphia.

Bob Smith, staff engineer for WRKO and WROR in Boston since 1976 was recently appointed chief engineer for the two radio stations. He came to WRKO/WROR from WTRY/WHSH in Albany, New York where he was chief engineer and consulting engineer for the Scott Broadcasting Corporation.

Buford Television announced the appointment of **John F. Swanson** as director of engineering/broadcast operations. Swanson comes to Buford from the position of vice president and director of engineering for WTVF-TV in Nashville.

Agencies/Associations

Thomas E. Bolger, president, WMTV-TV, Madison, Wisconsin, was elected chairman of the television board of directors of the National Association of Broadcasters. For the past year he has served as vice chairman.

The FCC announced that **Arthur L. Ginsburg** has been named chief of the broadcast bureau's complaints and compliance division. Ginsburg has been with the commission since 1961, most recently as assistant chief of the division.

The United States Senate has confirmed President Carter's appointment of **R. Peter Straus** as associate

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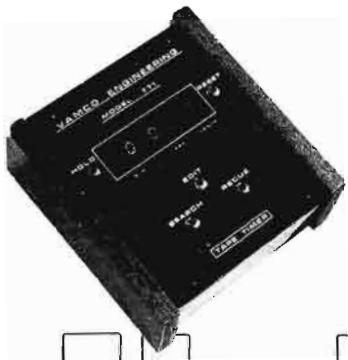

MODEL 771 VIDEO CASSETTE TAPE TIMER

The Model 771 timer is designed to be installed in minutes without tape machine modification on the SONY VO-2850, VO-2850A, VO-2860 and the BVU-200. The Model 771 enables precise times to be monitored for viewing, **editing,** and pre-roll cueing.

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MODEL 734 VIDEO TAPE TIMER

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people in the news

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director (broadcasting) of the International Communication Agency. Straus will continue to head the Voice of America, ICA's worldwide radio network.

Tom E. Paro was elected president of the Association of Maximum Service Telecasters. Paro has served as executive vice president of AMST since September 1977.

Federal Communications Commission Chairman Charles D. Ferris announced he has chosen **William B. Ginsberg** of New York as his economic assistant. Since October 1973, Ginsberg has been a securities analyst specializing in telecommunications with Blumenthal & Company.

Leon A. Wortman has joined The Michael Thomas Corporation, general management consultants, as vice president/senior consultant. He formerly headed his own consulting firm, LAW Associates.

Dr. Russell McKennan has joined the National Association of Broadcasters as assistant to the vice president and director of research. He also held that position in NAB's New York City office from June, 1968 until August, 1976.

Hunter Low, a director of advertising and promotion in Eastman Kodak's motion picture and audiovisual markets division, has been elected by the Broadcasters Promotion Association (BPA) to serve a one-year term as an associate member of the group's board of directors.

Manufacturers/Distributors

Daniel M. Zinn has been named president of Magnasync/Moviola Corporation, a subsidiary of Craig Corporation. Zinn joined the firm from the Anaconda Company where he was group executive for their electronics operations.

Recent appointments at Lenco include **Paul J. Leonard** as chairman of the board; **Andrew E. Perrin** as president and **Max K. Prill** as executive vice president.

SC Electronics has announced two major changes. **William S. Sadler** has been elected president and chief operating officer. He founded Miratel Corporation, which he managed until 1975. **P. L. Peterson**, a

continued on page 40

VAN LADDER INTRODUCES THE MODEL 2913 BC BROADCASTING UNIT

Are you plagued with costly interruptions, time consuming searches for clear transmission paths and set-up, and lost shots?

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The VanLadder Model 2913 BC Unit mounts on all styles and sizes of Electronic News Gathering vans with virtually no interior obstructions.

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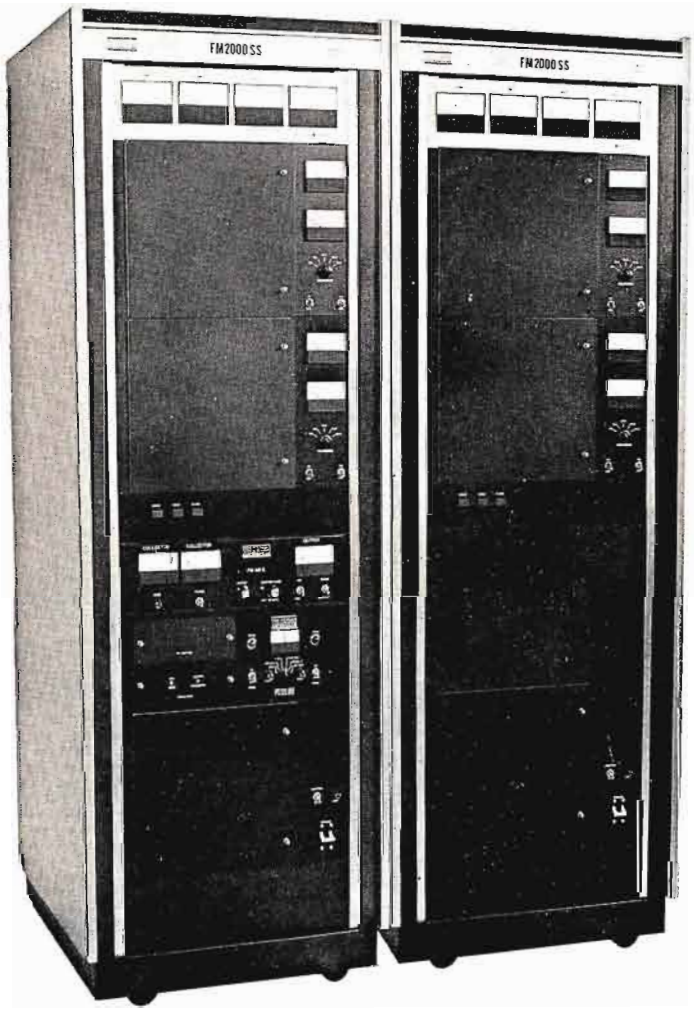
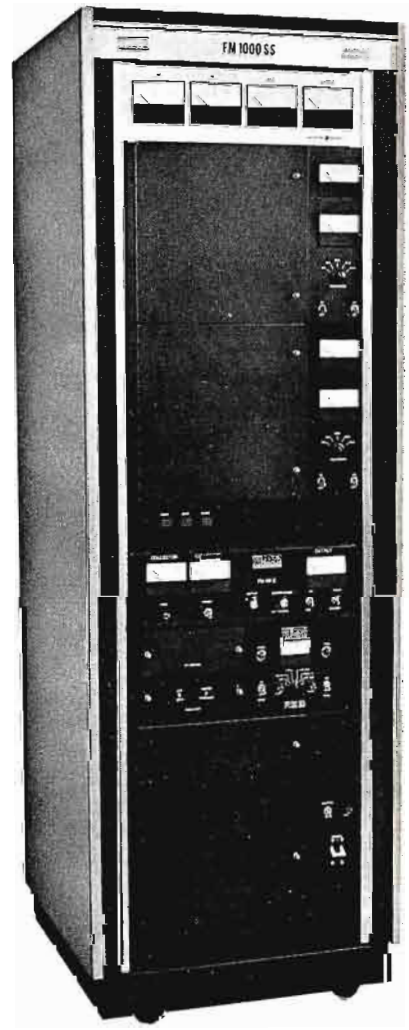


FM 500 SS/FM 1000 SS .5/1KW SOLID STATE FM TRANSMITTER



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people in the news

continued from page 38

veteran member of the division, has been elected vice president, finance.

Gordon Cook, Rank Optics lens designer, has been made a Fellow of the United Kingdom's Royal Television Society. Cook, who played a vital role in designing Rank's Varotal and Cooke lenses for television and motion pictures, was granted a fellowship in recognition of his design of zoom lenses for television and for services to the Society for thirty years.

Chiu

Lemoine

Moore

Donald Chiu, senior engineer, memory products division, and **Maurice Lemoine**, senior staff engineer, audio-video systems division, have been named winners of the Alexander M. Poniatoff award for technical achievement for fiscal year 1978 by Ampex Corporation.

Loral Corporation has elected **George W. Deskin** president of Conic Corporation and a corporate vice president. Deskin joins the firm from the applied technology division of Itek Corporation where he was president.

J. Kenneth Moore has been appointed vice president and general manager of the CBS Technology Center. Moore, a physicist who joined CBS in 1957, comes to the post after serving as director of advanced television technology at the center.

Frank M. Drendel has been elected vice chairman and chief executive officer of Valtec Corporation. Drendel was president and chief executive officer of Valtec's subsidiary, the Comm/Scope Company.

John B. Gantt has been promoted to vice president and general counsel of COMSAT General Corporation. He has been general counsel since July 1977 as well as secretary of the corporation.

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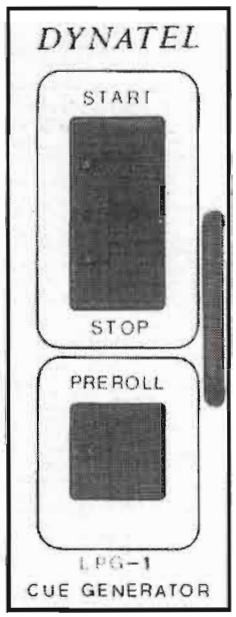
DYNATEL COUNTDOWN GENERATOR



Complete Automatic VTR Leader Format

- Provides automatic switching from color bars to countdown to incoming program
- Large countdown characters
- 400 Hz tone burst meets ASA 98.9
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- Maintains color sync during entire leader sequence
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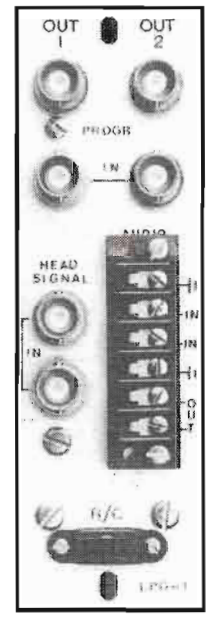

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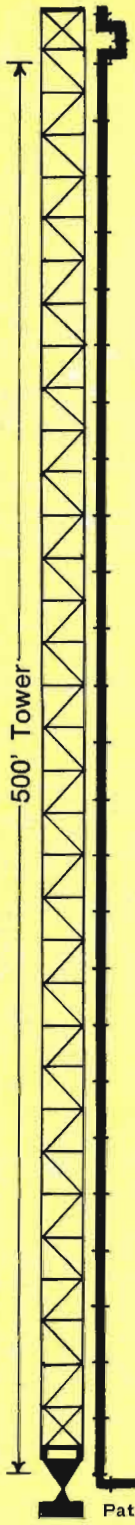


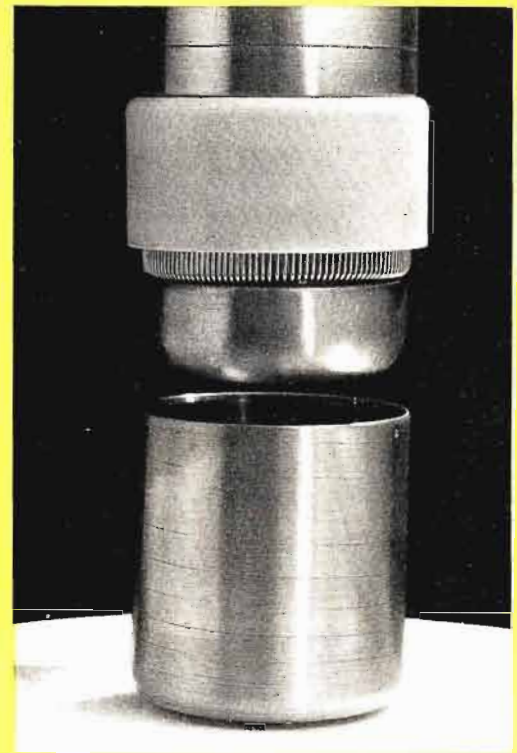
Transmission Line Reliability

We have replaced every major coax manufacturer's line and never had a breakdown or burn-out.

LUCK? No. We just build the most reliable transmission line you can buy.

Most TV & FM stations replace or make major repairs on their Coax System about every ten years. There are exceptions, ranging from 5 to 18 years, depending on the power & frequency of the station. Some Broadcasters believe this is the normal life cycle or bad luck. The fact is they buy the same type line that gave them the problems to begin with. One with the finger connector.

Transmission line is like a chain. **Weak links** cause failure and the **More Links** you have the less reliability. **Our transmission line alone** has no fingers to make poor contact or split. We are the **only manufacturer** to give you **one** contact joint per section of line. **All others give two.** (½ the links). Our wrist band connector makes contact at each segment of its spring giving it excellent surface contact (The finger connector has as little as one high point per finger times eight fingers per connector). Our inner conductors are made with heavy wall copper for better heat transfer and are less susceptible to installation damage than thin wall line. The thick wall also allows a generous taper on the female cup eliminating the knife edge common on thin wall line. Unlike the back to back finger connector that allows metallic dust to fall on its own insulator below causing the line to self-destruct, our connector captures all dust generated during its daily expansion cycle allowing it to maintain peak performance. After 15 years instead of replacing contaminated line or $100 connectors, simply slip on a $20 wrist band spring (leave the dust where it's at) and go on for another 15 years.



The chart below shows standard off the shelf 6⅛ coax. The unshaded area indicates what we consider desirable in a premium line for reliability.

68
CONTACT JOINTS
RCA
PRODELIN
PHELPS DODGE

34
CONTACT JOINTS
SWR

Patent No. 3,818,421

Manufacturer	S.W.R., Inc.	R.C.A.	Prodelin	Phelps Dodge
No. of contact joints each section of inner	One	Two	Two	Two
Types of contact at each section of coax line	Wrist Band Spring	Finger Connector Also Wrist Band Spring	Finger Connector Also Finger Connector	Finger Connector Also Finger Connector
Standard wall thickness of inner offered	Heavy .040	Thin .025	Heavy .040	Heavy .040
Has design to capture wear	Yes	Yes	No	No
Seals lower end of inner to prevent mfg. dust from falling out	Yes	No	No	No
Years of warranty by mfg.	Two	One	One	One

SWR INC.

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Luck? No. **RELIABILITY? YES!**

NEW SYSTEM

A system that will perform like new after 15, 30, even 45 years. We fabricate all components in 3⅛, 4, 6⅛ and 9" line. Our engineering Dept. will assist you with any installation planning.

OLD SYSTEM

We at SWR can fabricate inner conductors with our patented connector for replacement of your existing line giving you a better line than you purchased originally at a considerable savings over the cost of new line.

Besides transmission line call or write for information on Gas Barriers, Coax Switches, and our complete line of T.V. Antennas both horizontal and circular-polarized.

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people in the news

continued from page 40

Inova has announced the appointment of **James R. Goldberg** as vice president and director of new program development. Goldberg was most recently director of Design Communications.

Technology for Communications International has announced the election of **Gerald E. Solberg** as vice president. In this position, he will be responsible for structural engineering, manufacturing and antenna erection activities. Solberg has been with the firm since 1968, most recently as chief mechanical engineer.

Richard H. Bohnet has been named division vice president and general manager of the video products division of Fairchild Camera and Instrument Corporation. Bohnet joined Fairchild in 1968 and most recently was director of international marketing for consumer products.

The newly elected vice president of RCA's "Selcta-Vision" VideoDisc Project is **Richard W. Sonnenfeldt.** He has served the firm in various capacities including staff vice president of systems development and staff vice president of new business programs. In addition to holding over thirty U.S. patents, he has published many technical papers and articles.

Wally Brisco has been appointed vice president of Gardiner Communications and will be responsible for the satellite earth station segment of the firm's activities. Before joining the firm, Brisco was senior vice president, operator services, for the National Cable Television Association.

The switch division of Oak Industries has announced the appointment of **David B. McFadden** as vice president, product engineering. McFadden will coordinate product engineering functions.

David M. Stern has been appointed executive vice president of L-W International where he most recently served as vice president for engineering and manufacturing.

Arch C. Luther has been appointed to the post of chief engineer of the RCA Commercial Communications Systems division. Chief engineer of Broadcast Systems since 1971, Luther will supervise and coordinate activities in the division's four business units. □

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When it comes to Quality Components Whirlwind puts them all together...

Whirlwind Music—Manufactures only the highest quality cable and cable systems available today: the famous Cobra™ & Snake™ guitar cords, the amazing Medusa™ & Multi Cables (from 6 to full 24 channel P.A. & recording snakes). And for your own creations: complete MK & SK replacement mike cables, speaker cables, and bulk wire with the finest professional quality plugs of all types. Plus custom P.A. snakes available.

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- **Outputs are destination orientated—20 x 1 crosspoint modules**
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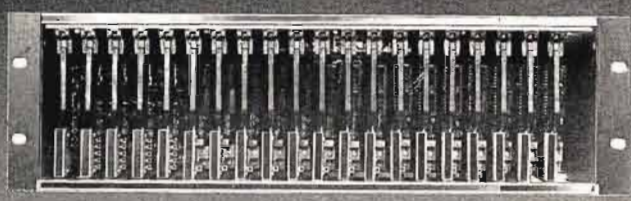
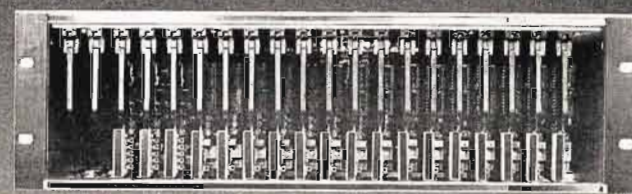


MODEL 5801 VIDEO ASSEMBLY



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Increasing the high frequency response of AM stations

By Lawrence L. Morton, consulting engineer in Anaheim, California

Over the past few years much has been written about ways to increase loudness and quality of broadcast signals. There are literally dozens of manufacturers building "little black boxes" that claim to—among other things—increase your average modulation and quality, boost your highs, and add presence to your signal.

I have encountered stations using no less than five different audio processors simultaneously, all the while the P.D. keeps yelling at the C.E. about the dull, mushy sound! It seems ironic that in this craving for quality audio one of the most important parts of the overall system is ignored: the bandwidth of the antenna matching network.

Not nearly enough emphasis is placed on the impedance that the transmitter has to work into, particularly at the sideband frequencies. Up to now a matching network was considered to be properly adjusted if, at operating frequency, the impedance the transmitter sees is the characteristic Z of the transmission line. Little or no value was given to the sideband impedances. This would be fine if we all listened to DC or if the laws of physics didn't require the formation of sidebands to carry intelligible information. Unfortunately though, this is not the case.

In AM transmission, the sideband frequencies are directly related to the modulation frequency. If a 10-kHz tone modulates a carrier, then sidebands appear 10 kHz above and below the carrier frequency. If the transmission system is expected to pass this tone without excessive attenuation and distortion, then the load presented to the transmitter at these sideband frequencies must be considered.

The importance of this point was noted in the late 1940s by W.H. Doherty[1] and J.B. Bishop, the latter being head of a development group of Bell Telephone Labs studying this subject. It appears that since then, very little effort has been given to this important consideration. If the resistance of the load rolls off significantly at sideband frequencies then the transmitter cannot be expected to modulate properly with high frequencies. The net result is a loss of highs and increased high-frequency distortion.

If equalizers are used to boost the upper end, the effect is that of an overall reduction in average modulation, completely defeating the audio processor's purpose. I've seen stations boosting the 5-10 kHz range by as much as 15 dB and wondering why they still have no brilliance. This article provides a cost-effective solution to the limited bandwidth offered by conventional matching networks.

If the impedance of an antenna or power divider in a directional array is measured at carrier, upper and lower sideband frequencies, it can be shown that for any given matching network configuration, three different networks would be required to match these measured impedances to the transmitter. (In this article I'm considering modulating frequencies out to 10 kHz or a 20 kHz matching network bandwidth.)

What is needed are elements in the matching networks that *track* the frequency and produce the same Z to the transmitter at all sideband frequencies. If this could be realized, then the load would appear as a constant resistance to the transmitter. It is possible to construct a network that approaches this ideal. (This point will become clearer in the examples to follow. A simple 'L' network is used for the examples to simplify calculations and explanations.)

In the first example, the station is

continued on page 47

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WHAT TO DO DURING YOUR NEXT OBSCENE PHONE CALL.

Order Eventide's BD-955 Broadcast Delay Line. It will delete your obscenities & tape loops. And more.

When Eventide — the world's foremost manufacturer of digital delay equipment* — decided to build a better time delay system for obscenity deletion, it went digital.

The result is the BD-955, a RAM based DDL providing up to 6.4 seconds of delay.

Substitute the BD-955 for the tape machine you're now loading, monitoring and changing tapes on. The BD-955 will allow plenty of time for either the engineer, announcer — **or both** — to hit remotable DUMP buttons.

The BD-955 cancels the objectionable program material; its rear-panel terminals allow automatic control of the phone and/or auxiliary equipment.

**According to Billboard Magazine's latest U.S. Equipment Brands Usage Survey, 44.9% of major U.S. recording studios use Eventide delay equipment vs. only 6.0% for the nearest competitive digital.*

THE BD-955's EXCLUSIVE CATCH-UP MODE:

Here's where the BD-955 really shows its stuff — and makes the switch to Eventide obscenity deletion as much a programming decision as a technical one —

When the DUMP button is hit, **programming instantly returns to real-time.** Here you have a choice — use The BD-955 merely to substitute for your old Tape delay & insert a profanity-fill cart, or *let it automatically build a new delay margin,* **digitally**. In its exclusive "Catch-Up" mode, the BD-955 can eliminate the need for a profanity-fill cart; the BD-955 automatically builds up delay after a deletion by increasing delay during pauses in the program. LEDs indicate the margin of protection afforded at any moment. Stay alert and the show can continue — in delay — almost immediately. Sound like magic? We've manipulated time like this for over five years.

When it's not being used for obscenity deletion, the BD-955 serves double-duty as a production tool. It allows front-panel selection of delays from 6.5 milliseconds up through the full delay available, for musical and segue effects — including vocal doubling and automatic double tracking (the audible illusion through which a single voice or instrument is made to sound like two) and digitally-clean slapback echo.

Other significant features about the BD-955 Broadcast Delay Line:

1. Full 15 kHz response and 90 dB dynamic range equals the specs of the best music recording delay lines; 7.5 kHz response, perfect for telephone talk shows *at lower cost*.

2. Full digital Random Access Memory. Like the Eventide 1745M music recording DDL, it runs cool, can take the mallet.

3. *It's available*. With more experience than any other manufacturer in building digital audio delay systems, the BD-955 is an extension of proven techniques. More than just a design: it's available now!

Pricing Information		FREQUENCY RESPONSE	
		7.5 kHz	15 kHz
DELAY	1.6 seconds	$2300	$2950
	3.2 seconds	$2950	$3900
	6.4 seconds	$3900	$6300

DUMP AND GO!

Eventide's BD-955 Broadcast Delay Line.

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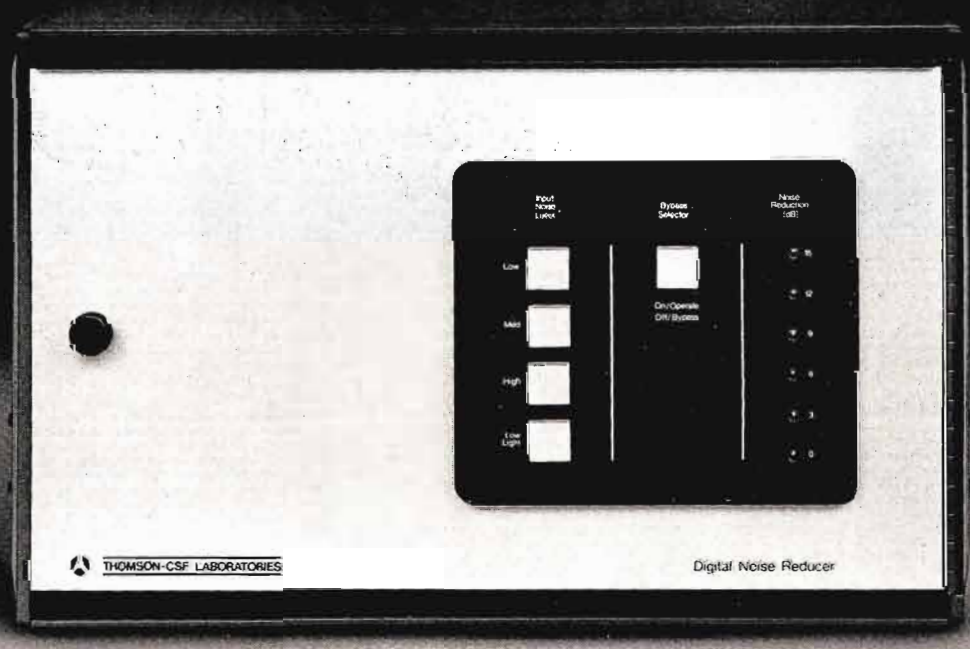
NOISE
NOISE
NOISE
NOISE



Video noise used to be a major problem for television engineers. Not anymore. Now it can be detected and eliminated with mathematical precision.

Thomson-CSF Laboratories introduces the Model 9000 Digital Noise Reducer.

By analyzing incoming video signals on an element by element basis, the Model 9000 Digital Noise Reducer achieves a 12 dB signal-to-signal ratio, with optimal correction upwards of 15 dB. Sounds amazing, and it is. That's the best in the industry!

It provides significant operational value where low-lighting or streaky chroma noise makes picture quality poor. With the Digital Noise Reducer, a marginal 40 dB input color television signal becomes a high quality 52 dB output signal. And no objectionable artifacts are introduced, if high quality video exists.

You'll discover dramatic improvements in both studio and remote applications. 2" Multi-generation video tape, U-Matic Multi-generation, Studio Cameras – Electronic film production, Microwave transmission, CATV, Satallite transmission, Off-air reception, Telecine film grain reduction and Electronic Journalism at low light levels are some examples.

Brighten up your picture with the Model 9000 Digital Noise Reducer. From Thomson-CSF Laboratories.

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The Digital Noise Reducer is quietly working for:

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KNXT Los Angeles, Ca.
KVAL-TV Eugene, Ore.
WCBS-TV New York, N.Y.
WCIV Mt. Pleasant, S.C.
WCSC-TV Charleston, S.C.
WGBH-TV Boston, Mass.
WNET Newark, N.J.

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Adcom, Toronto, Canada
Armed Forces Radio and Television Services
Byron Motion Pictures, Washington, D.C.
Compact Video Systems, Burbank, Ca.
Crest Film Labs, Hollywood, Ca.
Devlin Productions, New York, N.Y.
EUE Screen Gems, New York, N.Y.
Exxon Corporation, Mountain Lake, N.J.
F.T. Video Cassette Dup. Corporation, Leonia, N.J.
Goldmark Communications, Stamford, Conn.
Korean Broadcasting System, Seoul, Korea
Location Video, Glen Cove, N.Y.
Motion Picture Video Corporation, Toronto, Canada
NHK, Tokyo, Japan
Newsnet, Inc., Washington, D.C.
Nexus Productions, New York, N.Y.
Precision Video, New York, N.Y.
Producers Color Service, Detroit, Michigan
Rombex Production Corporation, New York, N.Y.
Roscor Corporation, Morton Grove, Ill.
Ruxton Limited, Burbank, Ca.
Theta Cable of California, Santa Monica, Ca.
Teletronics-International, New York, N.Y.
Turner Engineering, Mountain Lakes, N.J.

NETWORKS

ABC New York, N.Y.
ABC Los Angeles, Ca.
CBS New York, N.Y.
CBS Los Angeles, Ca.
S.C. Educational TV, Columbia, S.C.

Partial list of units in service.

Shouldn't our Digital Noise Reducer be working for you?

THOMSON-CSF LABORATORIES, INC.

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High frequency

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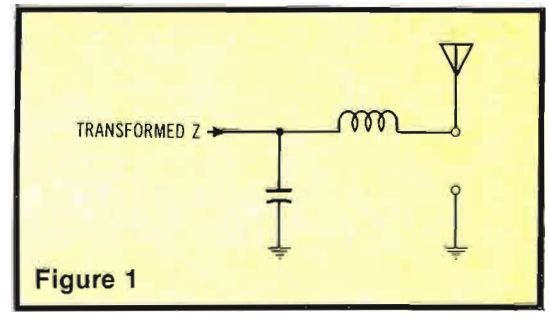

Figure 1

non-directional with a measure base impedance as follows:

$F_{+10\ kHz}$ (960 kHz) = 26.4-j35.4
F (950 kHz) = 27.5-j40.0
$F_{-10\ kHz}$ (940 kHz) = 28.5-j44.7

By using an optimized T-network (-92° phase shift) the resulting impedances are:

$F_{+10\ kHz} = 47.9 - j9.7$
$F = 50.0 + j0.0$
$F_{-10\ kHz} = 47.9 + j9.3$

Not bad but too much reactance at the sidebands. By calculating the required values needed in order to use an L-network, it was found that the series element required could not be realized because its value needed to change with frequency at a percentage rate smaller than the rate of change of frequency. The whole concept of the scheme is based on the rate of a reactance with respect to frequency. It is not possible to obtain a reactance that changes at a rate smaller than the rate of change of frequency (i.e., a coil with a reactance of j10 at 1 MHz will have a reactance of j20 at 2 MHz and no configuration will produce a lesser change.)

It is possible, however, to create a configuration whose rate of change is greater than that of the frequency change. In the above example it was necessary to transform the antenna impedances to values that could be matched to a 50-ohm transmission line using realizable components. A variety of values were tried until a combination of a series 13.4 uh coil and a shunt 5600 pf capacitor were arrived at. This combination produced an impedance that could be matched at operating and sideband frequencies to the transmission line Z. (Figure 1).

The values required for an L-network to match this transformed Z into the line are shown in Table 1. It can be seen that the series and shunt reactances are becoming more positive with an increase in frequency, indicating that these reactances are realizable. By combining a coil and cap in series or parallel (in this article series is used) a resulting reactance slope is obtained. Any two given components that produce a desired reactance at a particular frequency will have a different slope from any other combination of components giving the same reactance.

What this means is that two reactances (+j10 and -j30 in series, and +j1000 and -j1020 in series) will each give the same total reactance (-j20) at one frequency, but very different results at sideband frequencies. In the above example if the frequency was doubled, the first combination would produce +j5 and the second +j1490. What is needed are formulas giving the values of L and C necessary to produce the required slope. These formulas are:

$$C = \frac{1 - \frac{(F_u)^2}{(F_1)^2}}{\left[2\pi \frac{(F_u)^2}{(F_1)^2} (X_1F_1) - (X_uF_u)\right]}$$

$$L = \frac{1}{2\pi F_u}\left[X_u + \frac{1}{2\pi F_u C}\right]$$

Where:

F_u = upper sideband frequency
F_1 = lower sideband frequency
C = capacitance needed for slope combination
L = inductance needed for slope combination
X_u = reactance required at upper sideband frequency
X1 = reactance required at lower sideband frequency

From these equations it is calcula-

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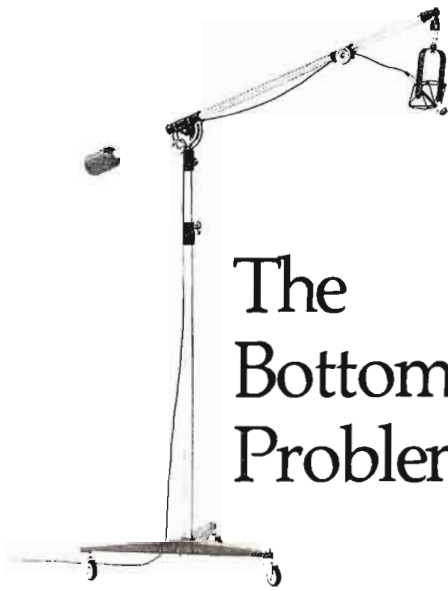

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High frequency

continued from page 47

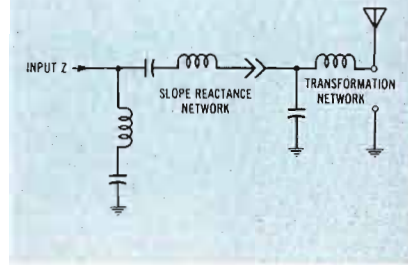
ted that the capacitor and inductor for the series leg are:

C = 798.1 pF
L = 45.91 uh

The closest available capacitor is 820 pF, so we use it and recalculate the L which is 44.97 uh. For the shunt leg the values calculated are:

C = 408.1 pF
L = 59.25 uh

Figure 2



The values used are 390 pF and 62.43 uh. The resulting network appears in Figure 2. The calculated input impedances are:

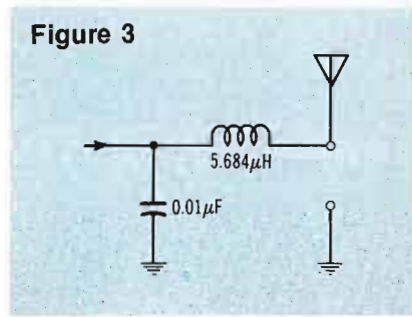
F_u = 49.2 - j0.36
F_o = 48.3 - j1.07
F_1 = 50.2 + j0.32

As can be seen, a significant improvement across the band is realized, particularly the sideband reactances. The impedance at operating frequency is not exactly 50 ohms because in calculating the L and C values, we assumed a linear relationship for the required reactances between the upper and lower frequencies. In some cases this deviation in linearity is greater than in others.

Another example, this time a directional array where the measured impedances into the power divider, were:

F_u (570 kHz) = 35.0 + j28.0
F_o (560 Khz) = 40.0 + j23.5
F_1 (550 kHz) = 45.0 + j18.3

Figure 3



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High frequency response

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The transformation network and impedances (Figure 3) are:

$$F_u = 16.61 - j37.63$$
$$F_o = 17.68 - j35.09$$
$$F_1 = 17.89 - j32.52$$

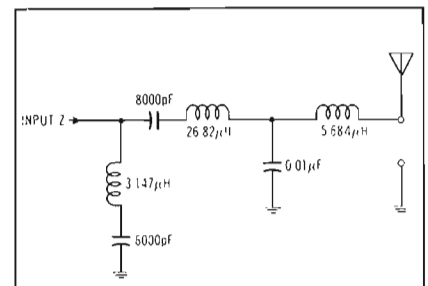

Figure 4

The slope network is shown in Figure 4.

The impedance seen by the transmitter is as follows:

$$F_u = 49.9 + j0.0$$
$$F_o = 49.5 - j1.1$$
$$F_1 = 50.0 + j0.0$$

The optimized T-network (104° phase shift) would produce:

$$F_u = 48.6 - j7.7$$
$$F_o = 50.0 + j0.0$$
$$F_1 = 48.7 + j7.0$$

In choosing transformation network components, it is necessary to try various values until a transformed impedance is found that can be matched to the line with realizable components. I use an HP-97 calculator to perform this task by letting it iterate until adequate values are obtained. By using a computer it would be possible to use T and π networks to provide the match and/or transformation.

In an applied sense, it is necessary to pay particular attention to component layout as mutual coupling between components cannot be tolerated if proper operation is to result. That's where using a competent consultant to design, construct, and adjust the network really pays off.

Although more costly and time consuming to build than a conventional network would be, the improvement in high-frequency audio quality makes it a small price to pay, particularly when you add up what you've spent on compressors, limiters, and EQs in the last few years. □

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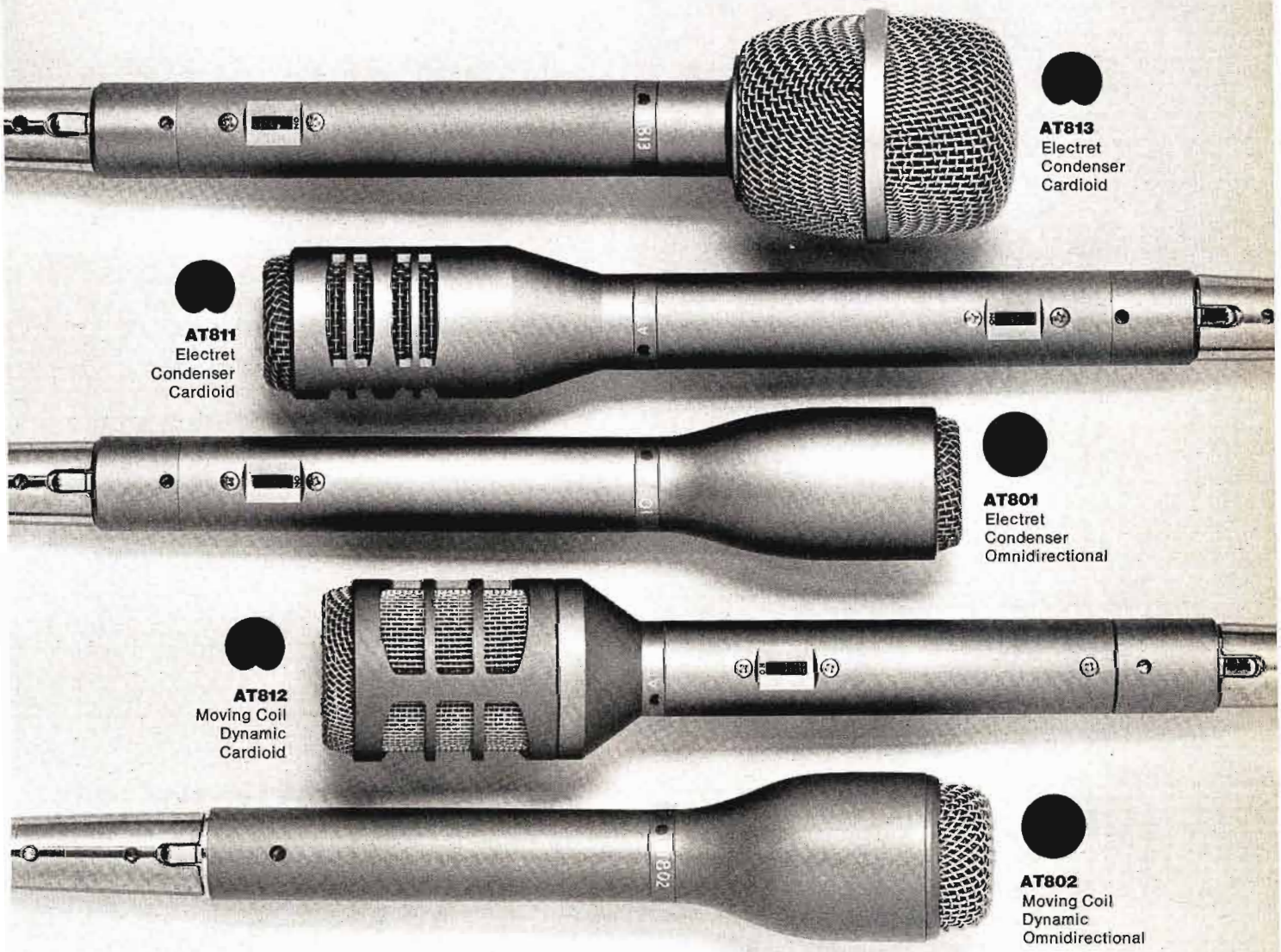
Audio-Technica introduces five new microphones... and a pleasant surprise.



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DIRECTIONAL ANTENNA BASICS

Part 6. Design of Five-Tower Systems

By Bob Jones, Consulting Engineer, La Grange, Illinois

Editor's Note: This is the final installment in a series of articles by Jones on antenna system configurations. References to previous articles in this series and Jones' book covering designs up to 12-tower systems will be found at the end of this article.

This article deals with five-tower directional systems. Although it may seem odd, six-tower systems are much more common than five-tower systems. The reason for this is the ability to achieve a greater variety of patterns with six than with five, plus there is some simplicity in the design mathematics.

Five towers

There are really only two five-tower configurations that can be employed. The most common is the in-line array, shown in Figure 1. The only other design is that of a box or rectangle wherein the fifth tower is at the mid-point of the other four. This is shown in Figure 2, and is really a "special case."

The in-line array can either be a two-tower system multiplied by a three-tower system, or four-tower system multiplied by themselves. A third possible way to look at this is to consider it as a four-tower parallelogram (in-line) with a fifth tower at the mid-point. These different basic concepts are shown in Figure 3.

The most common approach is that of Figure 3B. The following formula can be used (Equation 1):

$$E = Kf(\Theta)\left[\left(\frac{1+E_2^2}{2E_2} + \cos(\Psi_2 + S\cos\emptyset\cos\Theta)\right) x \left(\frac{1+E_3^2}{2E_3} + \cos(\Psi_3 + S\cos\emptyset\cos\Theta)\right) x \left(\frac{1+E_4^2}{2E_4} + \cos(\Psi_4 + S\cos\emptyset\cos\Theta)\right) x \left(\frac{1+E_5^2}{2E_5} + \cos(\Psi_5 + S\cos\emptyset\cos\Theta)\right)\right]^{1/2}$$

A comparison between this formula and that of Equation 3 in Part 4 reveals the addition of a fourth and fifth term to the basic three-tower multiplication formula.

Keep in mind that the designer has the same two major advantages here that he had with the three-tower and the four-tower designs. These are the facts that the bearings of each pair of two-tower nulls can be individually controlled, and that the depth of each two-tower null can be filled as much or as little as desired.

The example is that of WIMS nighttime. The value selected for each pair is shown on Figure 4. Table 1 is a step-by-step calculation of this pattern. Keep in mind that, as with any in-line array, the designer only

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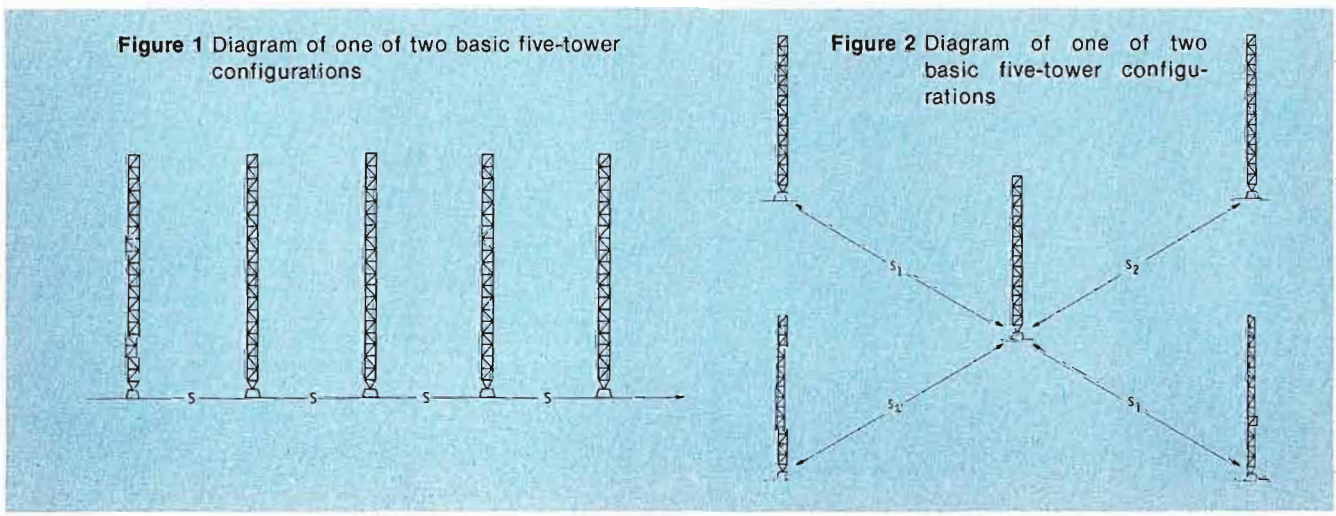

Figure 1 Diagram of one of two basic five-tower configurations

Figure 2 Diagram of one of two basic five-tower configurations

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Directional Antennas

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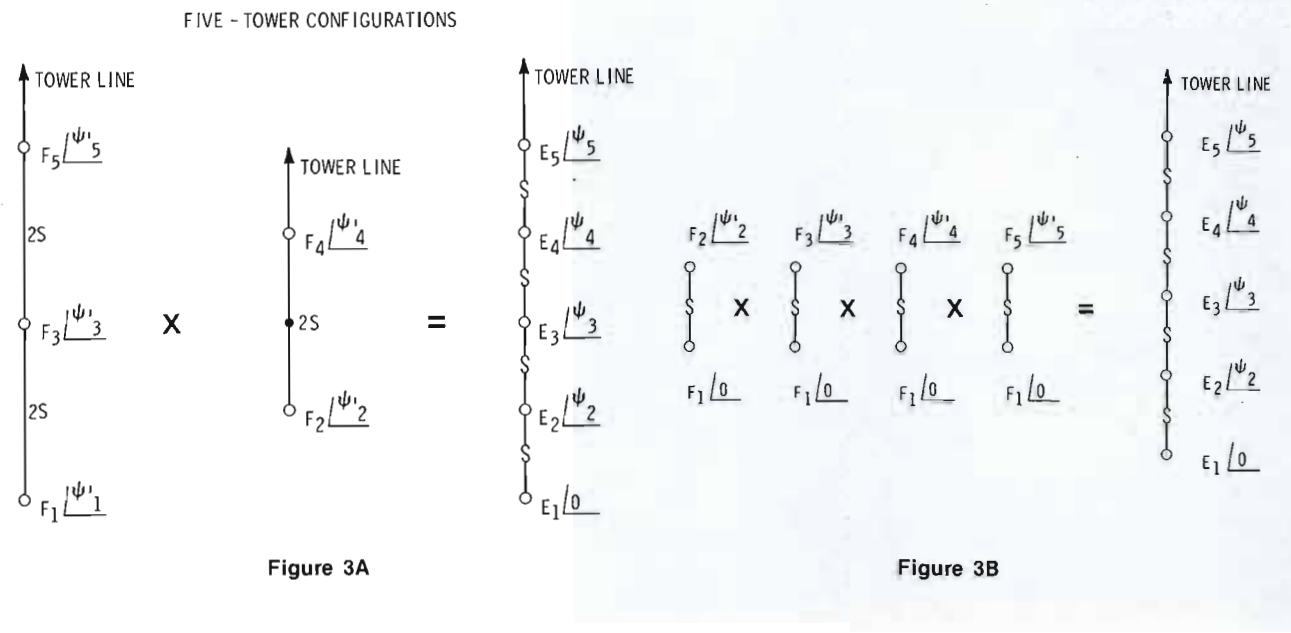

Figure 3A

Figure 3B

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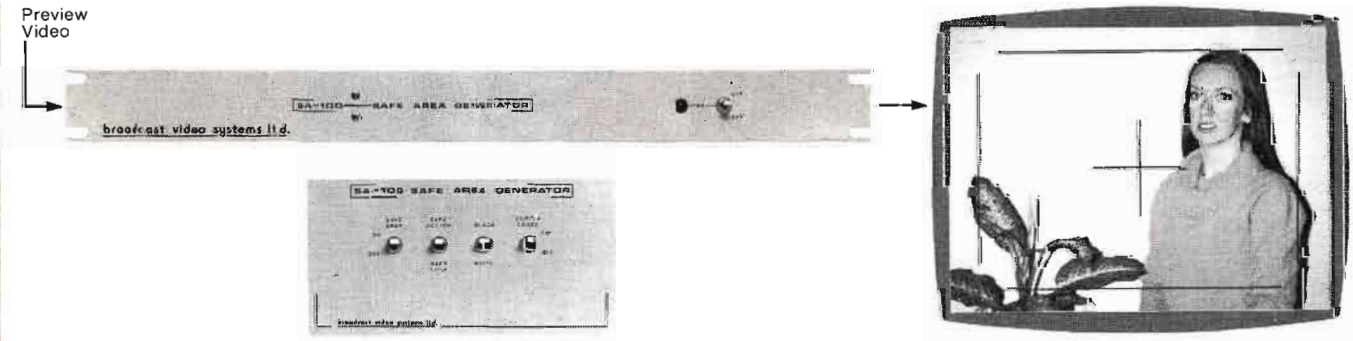
AT LAST, A STATE-OF-THE-ART METHOD TO ENSURE CORRECT POSITIONING OF PICTURE INFORMATION REGARDLESS OF MONITOR SCAN.

THE SA-100 SAFE AREA GENERATOR*



The SA-100 eliminates the guesswork of where to position graphics and other important information in a television picture. Vertical and horizontal borders, 120 nanoseconds wide, are generated and non-additively mixed into the composite video connected to the SA-100 input. This "safe area" pattern, keyed into video, will appear at the SA-100 output for display on a picture monitor. The pattern can be remotely switched from Safe Title to Safe Action area substantially as specified in SMPTE Recommended Practice No. RP27.3.

Also included is a cross-hair pattern showing the exact picture center.

Both patterns can be switched on or off, black or white, from the remote panel included with the unit.

No external drives are required as all system timing is derived from program sync. This ensures that Safe Area is always correct, regardless of monitor scan adjustments.

A second output is provided which delivers a pattern signal only (not keyed into video) for in-house distribution.

** patent pending*

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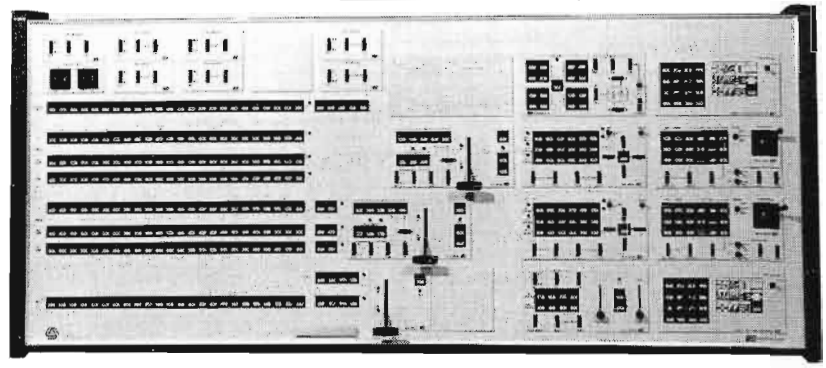

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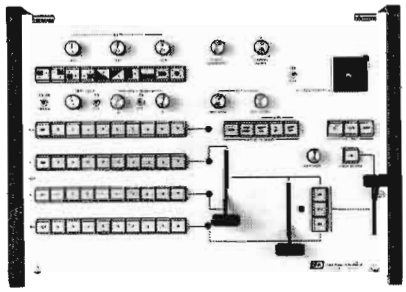

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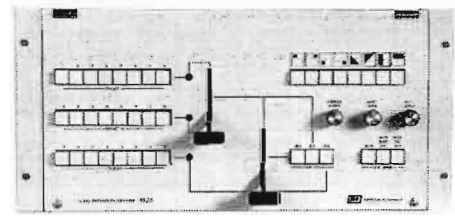

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Directional Antennas

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TABLE 1
FIVE-TOWER MULTIPLICATION IN-LINE DESIGN

$$E = K\,[E_1 + E_2 \angle\Psi_2 + S\cos\emptyset + E_3 \angle\Psi_3 + 2S\cos\emptyset + E_4 \angle\Psi_4 + 3S\cos\emptyset + E_5 \angle\Psi_5 + 4S\cos\emptyset$$

Where: $E_1 = E_2 = E_3 = E_4 = 1.0$; $S = 90°$, $\Psi_2 = 165°$, $\Psi_3 = 170°$, $\Psi_4 = 132.5°$, $\Psi_5 = -90°$, $E_5 = 0.582$

Substituting:**

$$E = K\left[(1 + S\cos\emptyset + \Psi_2)(1 + S\cos\emptyset + \Psi_3)(1 + S\cos\emptyset + \Psi_4) + \left(\frac{1 + 0.582^2}{2(0.582)} + S\cos\Psi_5\right)\right]^{1/2}$$

A	B	C	D	E	F	G	H	I	J	K	L	M
ø	90 cos A	165+B	1+cos C	170°+B	1+cos E	132.5-B	1+cos G	B-90	1.15+cos I	D•F•H•J	$K^{1/2}$	L•K[1]
0	90.0	255.0	.7411	260.0	.8264	-42.5	1.7373	0.0	2.1500	2.2876	1.5120	963.3 MV/M
10	88.6	253.6	.7076	258.6	.8023	-42.9	1.7205	-1.4	2.1490	2.1000	1.4490	923.1
20	84.5	251.6	.6497	254.5	.7328	-48.0	1.6691	-5.4	2.1450	1.7040	1.3050	831.4
30	77.9	242.9	.5444	247.9	.6238	-54.6	1.5793	-12.1	2.1280	1.1413	1.0680	680.4
40	68.9	233.9	.4108	238.9	.4835	-63.6	1.4446	-21.1	2.0830	.5976	.7730	492.5
50	57.8	222.8	.2662	227.8	.3283	-74.7	1.2638	-32.2	1.9960	.2203	.4690	298.8
60	45.0	210.0	.1339	215.0	.1808	-87.5	1.0436	-45.0	1.8570	.0469	.2165	137.9
70	30.8	195.4	.0340	200.0	.0603	-101.7	.7972	-59.6	1.7360	.0028	.0533	33.9
80	15.6	180.5	.0000	185.5	.0048	-116.9	.5476	-74.4	1.4190	.0000	.0000	0.0
90	0.0	165.0	.0340	170.0	.0152	-132.5	.3244	-90.0	1.1500	.0002	.0139	8.8
100	-15.6	149.4	.1392	154.4	.0982	-148.1	.1510	-105.6	.8811	.0018	.0426	27.1
110	-30.8	134.6	.3015	140.0	.2339	-163.3	.0422	-120.8	.6439	.0019	.0437	27.8
120	-45.0	120.0	.5083	125.0	.4264	-177.5	.0009	-135.0	.4430	.0001	.0095	6.0
130	-57.8	107.2	.7042	112.2	.6221	-190.3	.0161	-147.8	.3038	.0021	.0463	29.5
140	-68.9	96.1	.8937	101.1	.8075	-201.4	.0689	-158.9	.2171	.0108	.1039	66.2
150	-77.9	87.1	1.0500	92.1	.9634	-210.0	.1375	-167.9	.1722	.0239	.1547	98.5
160	-84.5	80.4	1.1650	85.5	1.0785	-217.0	.2014	-174.6	.1544	.0390	.1976	125.9
170	-88.6	76.4	1.2350	81.4	1.1495	-221.1	.2484	-178.6	.1503	.0526	.2293	146.1
180	-90.0	75.0	1.2590	80.0	1.1738	-225.5	.2627	-180.0	.1500	.0582	.2413	153.7

**Converted to multiplication formulas.

K^1 = 626.9, RMS = 400 MV/M

continued on page 60

The Model 6220 In-Line Image Enhancer provides overall signal enhancement and detail gain, as well as level dependent aperture equalization. It also features a built-in RGB decoder for chroma key applications.

The Model 6210 RGB Image Enhancer allows the operator to adjust black region noise and background activity which can particularly improve tape quality in film transfer work.

For more information, circle our reader service card number.

3M Video Systems. Watch us in action.

3M COMPANY

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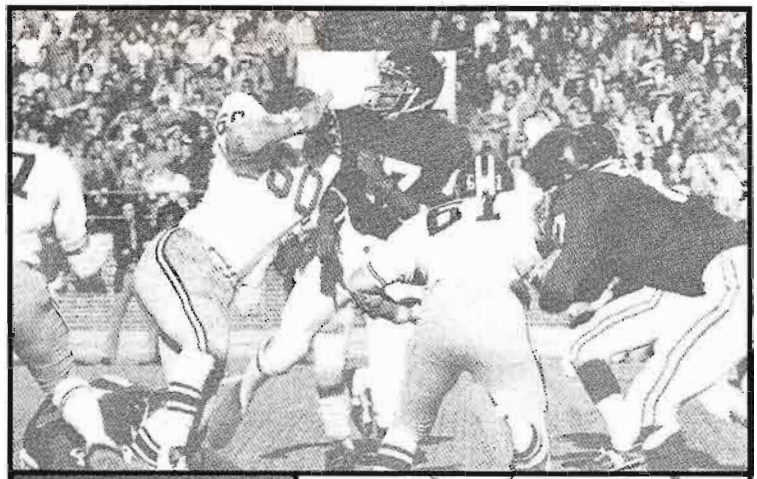

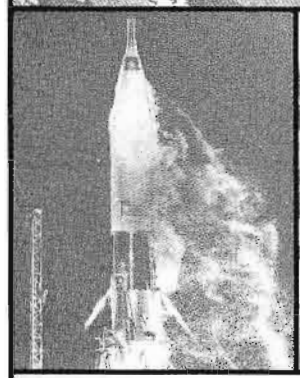

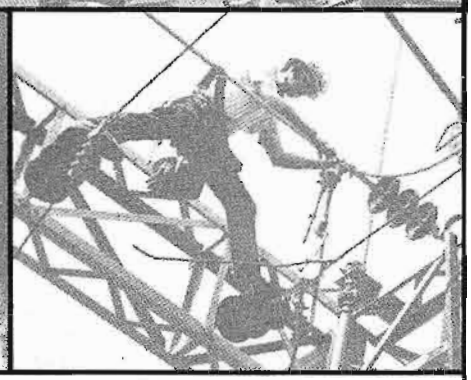

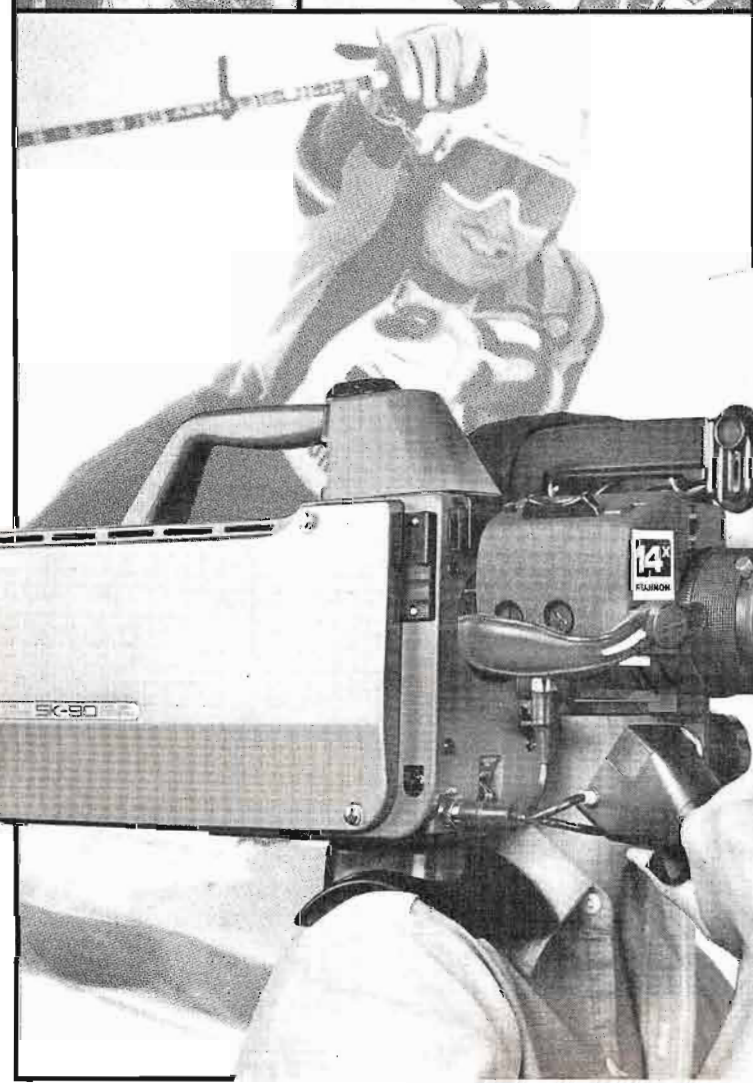

The HITACHI SK-90

Unsurpassed Picture Quality in a Free-Ranging Portable.

High technology in camera design is Hitachi's business. And the phenomenal SK-90 shines among Hitachi's previous successes.

With the comfortably balanced, self-contained SK-90, you can go on location and shoot action features, documentaries, commercials, training and sales tapes—without worrying about complex equipment, tripping over bulky cords, or staggering under heavy loads—and always producing an image truly worthy of broadcast transmission. The SK-90's sophistication makes it easy for you. Anyplace, anywhere from sub-zero to over 100° F. operating temperatures.

Technological advances? The SK-90 is brimming with them.

A Hitachi-developed Automatic Beam Optimizer (ABO) circuit cuts out the comet-tailing effect common to lesser cameras when shooting highly reflective objects.

Three 2/3" Saticon tubes combine with a smaller-size high index beam splitting prism to deliver better than 500-line horizontal resolution and better than 51dB signal-to-noise ratio.

And, of course, there are all the additional features that assure sharp, crisp pictures and true colors: built-in 2H contour enhancer with comb filter...standard I & Q encoder...switchable color bar generator...automatic white balance...automatic iris...and a built-in Genlock circuit using black burst to lock your SK-90 to other cameras.

Options include a built-in linear matrix masking amplifier for high fidelity color rendition and a complete remote operating unit which lets the camera range up to 1000 feet away on standard camera cable. For an even greater working range of over 3000 feet, a Digital Command Unit/Triaxial Cable System is also available.

Remarkably, the Hitachi SK-90 may be the first affordable, self-contained portable that doesn't compromise. Contact your Hitachi dealer for more details.

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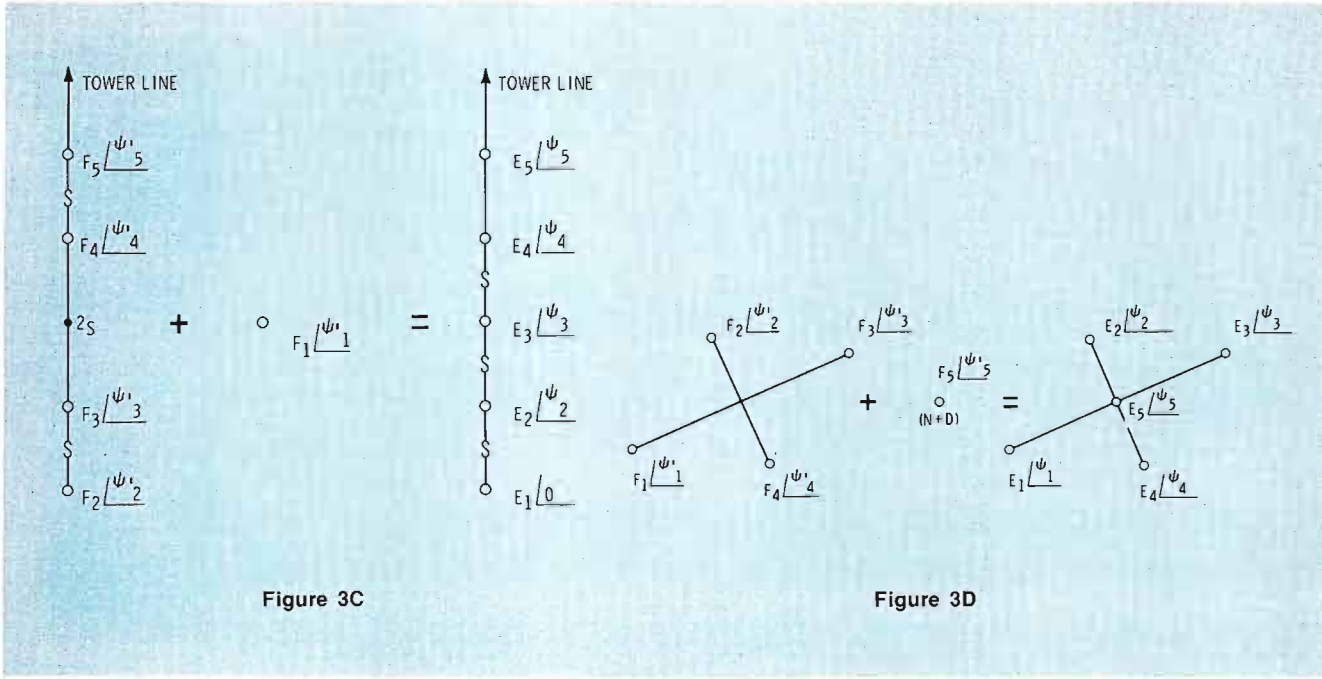
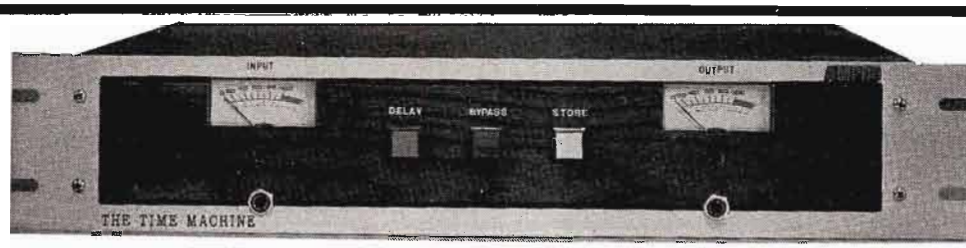


Figure 3C **Figure 3D**

continued on page 62



The Time Machine™

Six-Second Audio Digital Delay

Its Benefits Speak for Themselves!

Eliminate forever the maintenance headaches, on-air tape failures, cleaning, tape replacement and the audio quality degradation inherent in audio tape delay systems.

The Time Machine by Ampro is ideal for talk show censoring, and previewing of live telephoned news inserts.

Incorporates a STORE mode which allows the operator to electronically store a lead-in announcement which is read out at the beginning of delay cycle. The electronically stored lead-in announcement is replaced in memory by the delayed message.

For a permanent lead-in announcement of music fill insertion during censoring. The Time Machine will automatically time and control an auxiliary tape cartridge playback unit for fill insertion at any live to delay mode transition.

Build-in timing synchronizes the full read out of memory contents with the switch from delay back to live operation.

SEND FOR DETAILS

Allied Broadcast Equipment

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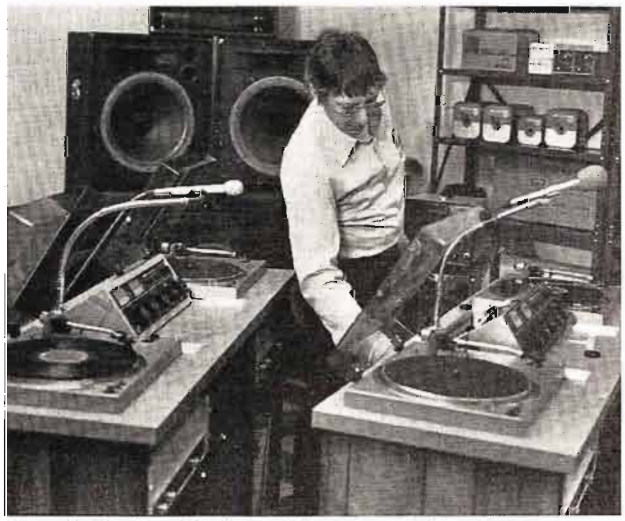
PROFESSIONAL

Ohio Disco Packager, SWB Electronics, uses Stanton Exclusively.



Larry L. Decker, Designer/Owner, examines finished control table for Disco use.

The trend to Portable Disco continues strong. An ambitious Company in Canton, Ohio, SWB, is achieving excellent success with their units (their goal is a national franchising operation). James C. Fravel, General Manager/Promotions, writes to Stanton, "We are using Stanton cartridges in each and every unit we sell. Two of our units have been running for about a year and a half without failure. We are quite proud of the track record of our units and the Stanton cartridges."

They use the 500AL because it's a durable cartridge and "gives SWB a 4 dB base boost that we like to have with the music we play. It has been, by far, the best cartridge we have used (and we have tried many)".

So, Stanton, world famous for its top-of-the-line calibrated cartridges, the 881S and the 681 series, also serves the professionals in an interesting branch of the Disco Industry.

Whether *your* usage involves recording, broadcasting, archives, disco or home entertainment, your choice should be the overwhelming choice of the professionals in every field . . . Stanton Cartridges.

For further information write to: Stanton Magnetics, Terminal Drive, Plainview, N. Y. 11803

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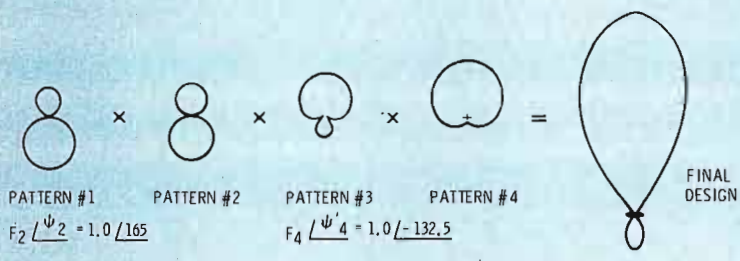
Figure 4 — **WINS In-Line Design**

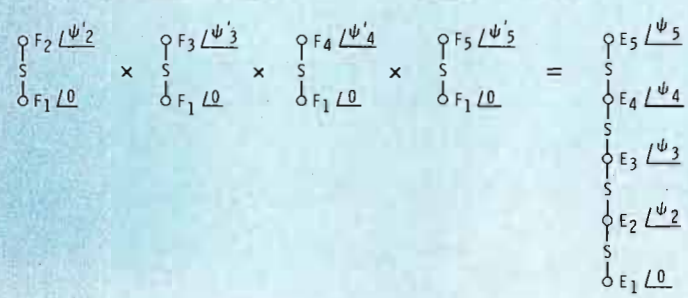


$F_2 \angle \Psi'_2 = 1.0 \angle 165$

$F_4 \angle \Psi'_4 = 1.0 \angle -132.5$

$F_3 \angle \Psi'_3 = 1.0 \angle 170$

$F_5 \angle \Psi'_5 = 0.582 \angle -90$



Determination of Base Values, S = 90

$E_1 \angle 0 = F_1 \angle 0$

$E_2 \angle \Psi_2 = F_2 \angle \Psi'_2 + F_3 \angle \Psi'_3 + F_4 \angle \Psi'_4 + F_5 \angle \Psi'_5$

$= 2.7720 \angle -161.35^\circ$

$E_3 \angle \Psi_3 = F_2F_3 \angle \Psi'_{2+}\Psi'_3 + F_2F_4 \angle \Psi'_{2+}\Psi'_4 + F_2F_5 \angle \Psi'_{2+}\Psi'_5 +$
$F_3F_4 \angle \Psi'_{3+}\Psi'_4 + F_3F_5 \angle \Psi'_{3+}\Psi'_5 + F_4F_5 \angle \Psi'_{4+}\Psi'_5$

$= 3.2660 \angle 43.6^\circ$

$E_4 \angle \Psi_4 = F_2F_3F_4 \angle \Psi'_{2+}\Psi'_{3+}\Psi'_4 + F_2F_3F_5 \angle \Psi'_{2+}\Psi'_{3+}\Psi'_5 +$
$F_3F_4F_5 \angle \Psi'_{3+}\Psi'_{4+}\Psi'_5 + F_2F_4F_5 \angle \Psi'_{2+}\Psi'_{4+}\Psi'_5$

$= 1.9294 \angle -105.10^\circ$

$E_5 \angle \Psi_5 = F_2F_3F_4F_5 \angle \Psi'_{2+}\Psi'_{3+}\Psi'_{4+}\Psi'_5$

$= 0.582 \angle 112.50^\circ$

continued on page 64

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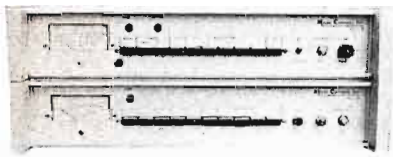
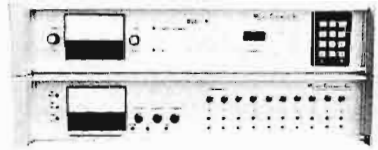
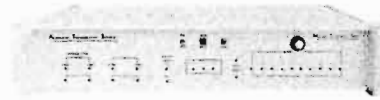
Engineered for Excellance — Designed for Dependability







STUDIO-TRANSMITTER LINK (PTS-10/PRS-10)
- 10 Watts RF Output Power
- 2 Watt Monitor Amplifier in Receiver
- Direct Reading Forward & Reflected Power
- Sub Channel Injection Set on TX Front Panel
- "Hot-Standby" Switching Capability
- Compact Modular Construction

REMOTE CONTROL (DLC-9/DLT-9)
- Modern "Touch-Tone" Channel Address
- Digital for Command Accuracy & Analog for Telemetry Speed
- Continuous Channel Verification
- Available for Radio or Hard Wire Operation
- Expandable to 19, 29 or 39 Channels
- Expanded Scale Accuracy ±0.2%

AUTOMATIC TRANSMITTER SYSTEM (ATS)
- Completely Self-Contained Modulation Monitor Built In
- Direct or Indirect Method of Power Sampling & Measurement
- Continuous Monitoring of Power and Modulation
- Selectable Peak Modulation Count on a Per Minute Basis
- LED Display Indicates Over-Modulation Counts Per Minute

OTHER ACCESSORIES FROM MCA:
- PLG-10 Sub-Carrier Generator
- PLR-10 Sub-Carrier Receiver
- TSU-10 Automatic Transmitter Switcher
- RSU-10 Automatic Receiver Switcher
- Antennas, Transmission Line & Fittings

MICRO CONTROL ASSOCIATES

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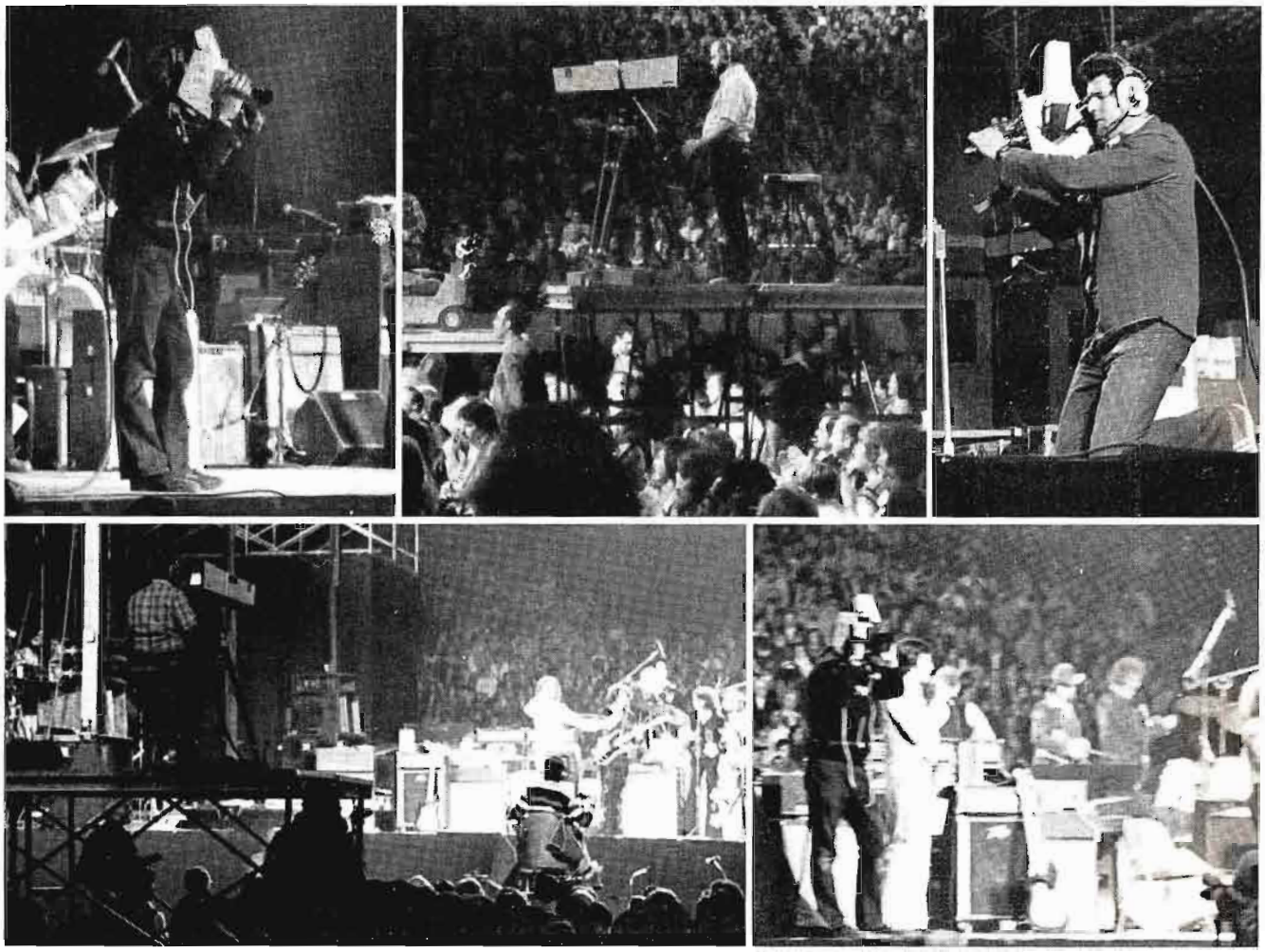

"Shooting a 2-hour network special with CEI-310 cameras was a real experience."

Says the well-known director Vincent Scarza: "I'd heard about CEI-310 cameras, but I'd never worked with them."

Scarza had the opportunity to work with them at 'The World's Largest Indoor Country Music Show,' a 2-hour NBC prime time special edited from 4½ hours of videotape, shot at the Silverdome in Pontiac, Michigan in front of a live audience of 65,000.

Besides directing, Scarza co-produced with executive producer Jim Fitzgerald of Rudy Callicutt Productions. Complete video production facilities and crew were provided by Northwest Teleproductions.

The production involved seven cameras. Four were versions of the CEI-310—two hand-held portables, one portable in a mobile cart, and one studio version.

"I was amazed," says Scarza, "at the absolutely marvelous pictures produced by the CEI cameras—even under difficult lighting conditions.

"Maneuverability of the portable units was incredible. My cameramen were able to get fantastic hand-held shots. Since they had 4½ hours of non-stop shooting, light weight was really important.

"All in all, it was a dynamite performance. Anybody who hasn't worked with the CEI-310 really doesn't know what they're missing."

Isn't it time you looked at the CEI-310? Call your local CEI dealer now. Or get in touch with Commercial Electronics, Inc., 880 Maude Avenue, Mountain View, California 94043, (415) 969-1910.

Changing the look of field production.

CEI

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Directional Antennas

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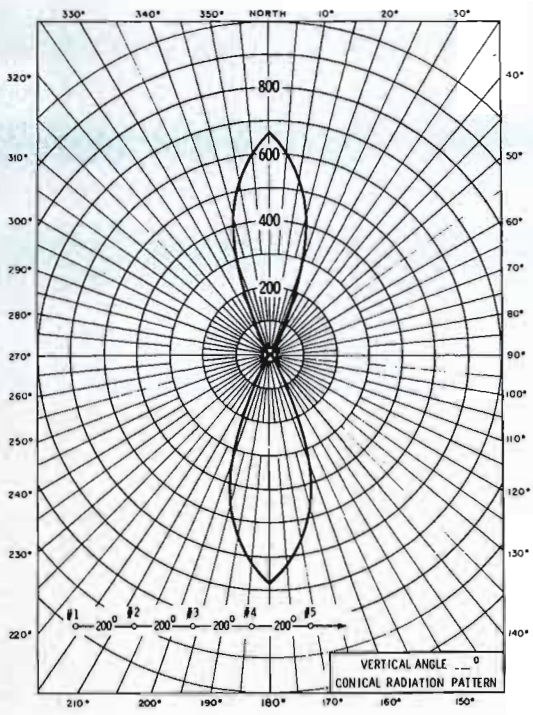

Figure 5

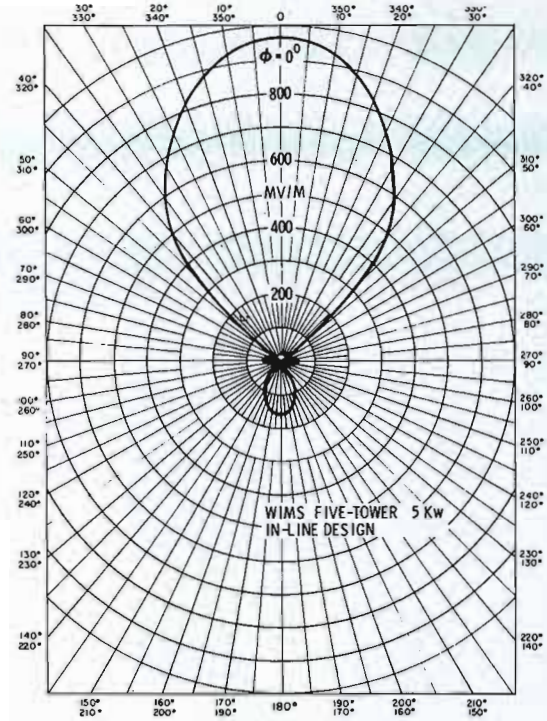

Figure 6

continued on page 68

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THE BETTER WAY

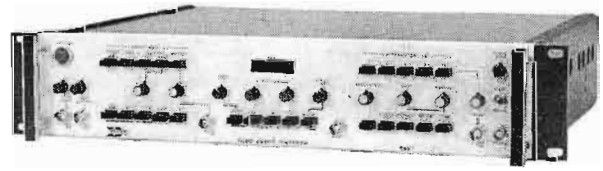
Datatek - for television frequency response and envelope delay measurements

Model D-640
For envelope delay measurements -

The D-640 is intended for use with the D-630A Video Sweep Generator to provide swept or spot frequency envelope delay measurements. It permits displaying simultaneously on an oscilloscope both amplitude and delay characteristics. Measurements of delay can be made regardless of path length. The D-640 is self calibrating through the use of crystal controlled digital circuits. **ONLY $2,400.**

For equipment adjustments and performance measurements - Models D-630A and D-631

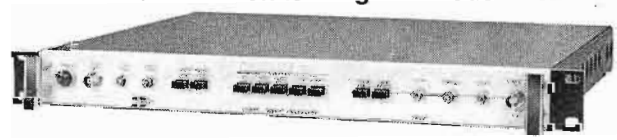
The Model D-630A Video Sweep Generator is ideally suited for measuring and optimizing station video equipment. It includes comprehensive marker facilities with frequency readout, fixed and variable sweep rates, CW mode and internal as well as external sync and blanking facilities. A color burst adder is available as an option for the D-630A. **ONLY $2,400.**



The D-631 incorporates all the same facilities as the Model D-630A but additionally includes a detector and calibrated attenuator. **ONLY $2,775.**

Other Advanced Datatek Products:
Routing Switcher Systems, TV Transmitter Color Phase Equalizers and Waveform Correctors, Video Sweep Generators, Distribution Amplifiers for video, pulse, audio and SMPTE time code signals

For use as a station test signal - Model D-629



This Datatek Video Sweep Generator has inputs for sync and blanking to generate a composite video sweep signal synchronous with station pulses. It is used to route video sweep throughout the plant to monitor system frequency response, providing considerably more comprehensive information than a multiburst. **ONLY $1,700.**

For More Information, Write or Call

DATATEK CORP.

1166 W. CHESTNUT ST. UNION, N.J. 07083 • (201) 964-3656

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INNOVATION '78

...the finest most complete line of cameras and broadcast equipment ever offered by one company—Philips.

Philips, with over 3 decades of leadership in cameras, transmitters, turn-key studios, mobile vans, systems, around the world.

Philips, the company that revolutionized color broadcasting in 1965 with the development of Plumbicon™ tube technology and the legendary Philips Norelco PC-60 camera.

Now, presenting the highlights of Philips latest line of innovative equipment as demonstrated to SRO audiences in our NAB "Innovation '78" exhibit:

PHILIPS

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LDK-25 Camera Family with New Diode-Gun Plumbicons. Our new 1-inch 73XQ Plumbicon tubes and camera circuitry give you *higher resolution and lower lag than 30mm cameras.* Better than 65% depth of modulation at 400 lines! With new

Dynamic Beam Control (DBC) to control hot highlights, as much as 4 f-stops over peak white. The finest, state-of-the-art multicore studio and field camera system ever produced is now better than ever. Plus, *only* Philips rear-loading design, as in the advanced LDK-25 camera family, can deliver the *maximum* out of this new diode-gun tube technology.

NAB '78 also saw the addition of a new production portable to the LDK-25 family. The compact and lightweight LDK-15L matches the picture quality of either the LDK-25 multicore or LDK-5 digitally controlled triax cameras, enabling it to be used either as a compact studio camera or in the field as part of a multiple camera system. Totally compatible, the LDK-15L can be used with the base station of the LDK-5 or the CCU of the LDK-25.

Philips UHF/VHF Transmitters, famous around the world for high reliability and low operating cost, are now *the most rapidly growing transmitters in North America.* Over 37 already installed since introduction to the U.S. and Canada... and over 1000 worldwide.

Transmitter output power range up to 110 kW. Equally suited for single or parallel operation. Designed for unattended operation with automatic or remote control.

Features include: I.F. modulation, solid state design except for power stages. High stability. Ease of installation and maintenance. SAW filter, reducing the number of controls to achieve proper group-delay. Small size and minimum floor space are made possible by the advanced design and a unique common exciter which can also be retrofitted into earlier competitive systems. UHF offers a choice of internal or external vapor cooled Klystrons.

VIDEO 80...the Incredible Convertible Camera and Complete Production System for multi-use applications. Converts to ENG, Field Production, Studio, or Special Applications (telecine, microscope, operating room lamps) with just a change of slide-on viewfinder and plug-in electronics.

Simple to set up and operate because the test features are built-in, with "no compromise" performance. With automatic features for total mobility.

Compact, rugged, lightweight and economical. Designed to go anywhere, do anything. And, Video 80 systems are expandable and compatible with existing equipment for additional cost savings.

LDK-14—New, 2/3-inch ENG/EFP/ Studio Systems Camera has the look and feel of a film camera with the picture quality and performance features of Philips studio cameras.

Features include: Outstanding broadcast picture quality for ENG, EFP, or full studio use. Lightweight, rugged, one piece. Low power consumption. Remote control option. High sensitivity. Dynamic Beam Control (DBC) for hot highlight handling. Fully automatic operation, including auto-centering, and switchable black stretch. 1½-inch and 5-inch view finders for hand-held or tripod use. Full bandwidth chroma key and triax facilities.

One Inch Video Recorders in both "C" and "B" formats to satisfy your requirements. Philips has always offered the widest selection of portable and studio camera systems to best meet your specific applications.

Now Philips expands this same "meet-your-needs" policy to include 1-inch VTR's and time base correctors, with both "C" format (PVR series) and "B" format (BCN series) VTR's in both portable and studio configurations.

Philips wide selection and systems experience provide the greatest objectivity and cost effectiveness in packaging systems to match your requirements.

Also presented at NAB:

The studio performance LDK-11, Field Production Portable and Compact Studio Camera. Full production control either remotely or at backpack. Up to 300' of ½" cable between camera head and backpack.

The LDH-20S, Economy Broadcast-Quality Studio Camera.

A new, versatile Sync Pulse Generator, LDK-4210.

A full line of Test and Measuring Equipment.

Altogether Philips displayed and introduced the widest range of cameras and broadcast equipment at NAB or anywhere else. For complete information write on your company letterhead (indicating product interest) today to:

Philips Broadcast Equipment Corp., 91 McKee Drive, Mahwah, N.J. 07430 (201) 529-3800. (Canada: Philips Broadcast Equipment, 601 Milner Ave., Scarborough, Ontario M1B 1M8).

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Directional Antennas

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TABLE 2
FIVE-TOWER FIGURE EIGHT

Equation: $E = Kf(\Theta)\left[\left(\frac{1+M_1^2}{2M_1} + \cos(\Psi_1 + S\cos\Theta\cos\emptyset)\right) \times \left(\frac{1+M_2^2}{2M_2} + \cos(\Psi_2 + S\cos\Theta\cos\emptyset)\right) \times \left(\frac{1+M_3^2}{2M_3} + \cos(\Psi_3 + S\cos\Theta\cos\emptyset)\right) \times \left(\frac{1+M_4^2}{2M_4} + \cos(\Psi_4 + \cos\Theta\cos\emptyset)\right)\right]^{1/2}$

Assumptions: $M_1 = M_2 = M_3 = M_4$, $\Psi_1 = +7°$, $\Psi_2 = -7°$, $\Psi_3 = +38°$, $\Psi_4 = -38°$, $S = 200°$, $f(\Theta) = 1.0$, $\Theta = 0°$

A	B	C	D	E	F	G	H	I	J	L	M	N
ø	200 cos A	B+7	1+cos C	B-7	1+cos E	B+38	1+cos G	B-38	1+cos I	D•E•H•J	√L	K•N
0	200.0	207.0	0.109	193.0	.026	238.0	.470	162.0	.048	0.000	0.000	0.0 MV/M
10	196.9	203.9	0.086	189.9	.015	234.9	.425	158.9	.067	0.000	0.000	0.0
20	187.9	194.9	0.034	180.9	.001	225.1	.304	149.9	.135	0.000	0.000	0.0
30	173.3	180.3	0.000	166.3	.028	211.3	.146	135.3	.289	0.000	0.000	0.0
40	153.2	160.2	0.059	146.2	.169	191.2	.019	115.2	.574	0.000	.010	1.8
50	128.5	135.5	0.287	121.5	.478	166.5	.028	90.5	.991	0.004	.061	11.1
60	100.0	107.0	0.708	93.0	.948	138.0	.257	62.0	1.488	0.253	.503	91.5
70	68.4	75.4	1.252	61.4	1.478	106.4	.718	30.4	1.863	2.475	1.573	286.3
80	34.7	41.7	1.747	27.7	1.885	72.7	1.297	-3.3	1.998	8.533	2.921	531.6
90	0.0	7.0	1.993	-7.0	1.993	38.0	1.788	-38.0	1.788	12.698	3.563	648.4
100	-34.7	-27.7	1.885	-41.7	1.747	3.3	1.998	-72.7	1.297	8.533	2.921	531.6
110	-68.4	-61.4	1.478	-75.4	1.252	-30.4	1.863	-106.4	.718	2.475	1.573	286.3
120	-100.0	-93.0	0.948	-107.0	.708	-62.0	1.469	-138.0	.257	0.253	0.503	91.5
130	-128.5	-121.5	0.478	-135.5	.287	-90.5	.991	-166.5	.028	0.004	0.061	11.1
140	-153.2	-146.2	0.169	-180.2	.059	-115.2	.574	-191.2	.019	0.000	0.010	1.8
150	-173.3	-166.3	0.026	-180.3	0.000	-135.3	.289	-211.3	.146	0.000	0.000	0.0
160	-187.9	-180.9	0.001	-194.9	.034	-149.9	.135	-225.1	.304	0.000	0.000	0.0
170	-196.9	-189.9	.015	-203.9	.086	-158.9	.067	-234.9	.425	0.000	0.000	0.0
180	-200.0	-193.0	.026	-207.0	.109	-162.0	.048	-238.0	.470	0.000	0.000	0.0
										35.228		

$$K = \frac{180}{\sqrt{\frac{35.228}{36}}} = 182.0$$

continued on page 70

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Directional Antennas

continued from page 68

need compute halfway around the pattern since all in-line designs are symmetrical about their tower lines. Figure 5 is the polar graph of WIMS.

To arrive at the final base current ratios and phases, it is necessary to convert the design values of each two-tower pair to the final tower values. Again the WIMS design is used as the example. It is suggested that you follow the equation shown in Figure 4 to convert individual pairs into final values.

Table 2 is a calculation of a five-tower in-line figure eight array. This type of pattern will achieve the maximum amount of gain off the two ends of the propellor blades. It also achieves very good suppression over a wide arc between the two major lobes.

Figure 6 is a graphical plot of the five-tower plot of Table 2.

Editor's Note: As previously stated, this is the final article in a series by Jones on the basics of directional antenna design. Previous articles in this series may be found in **Broadcast Engineering** as follows: Part 1, p. 46, February, 1977; Part 2, p. 30, April, 1977; Part 3, p. 34, July, 1977; Part 4, p. 59, February, 1978; Part 5, p. 54, May, 1978.

Further design details on antenna configurations covering single antennas through 12-tower systems are included in the *Directional Antenna Handbook* by Robert A. Jones. Copies of this book are available at $12.95 each from **Broadcast Engineering**, Technical Publishing Division, P.O. Box 12901, Overland Park, Kansas 66212.

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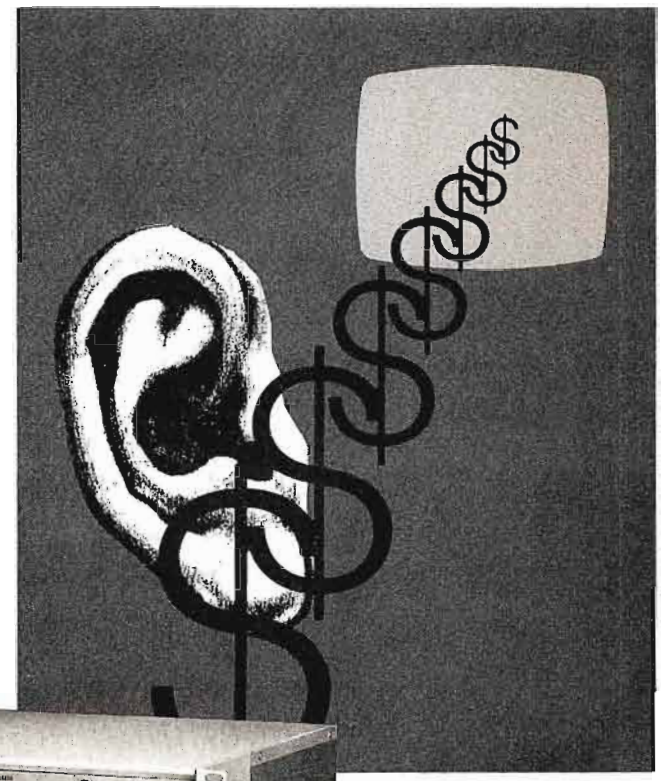

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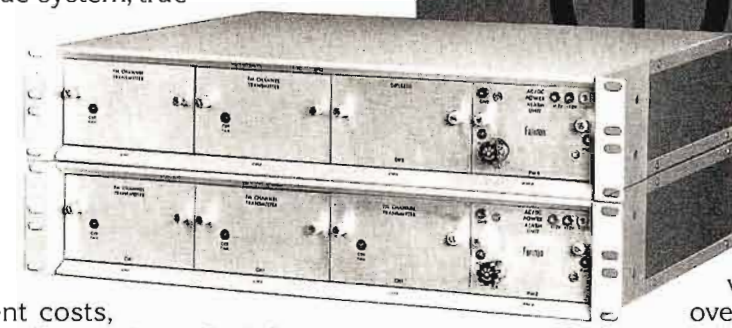

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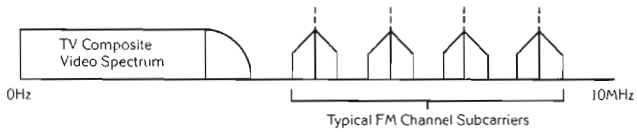

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Maximizing subcarrier deviation during simultaneous stereo transmission

Part 2
By James Tonne

Part 1 of this 2-part series appeared in the August, 1978 issue of **Broadcast Engineering,** page 42.

It should be pointed out at this time that the post-limiting filter may be located inside the subcarrier generator; some SCA generators have provision for plug-in filters. By the same token, some limiters have plug-in output networks. and insertion of the correct network will do the job. It is equivalent electrically to locate the filter in either location.

There will be a treble rolloff due to this filter. That rolloff can be corrected (fully, at low modulation levels) by boosting the upper audio frequencies prior to or within the

continued on page 74

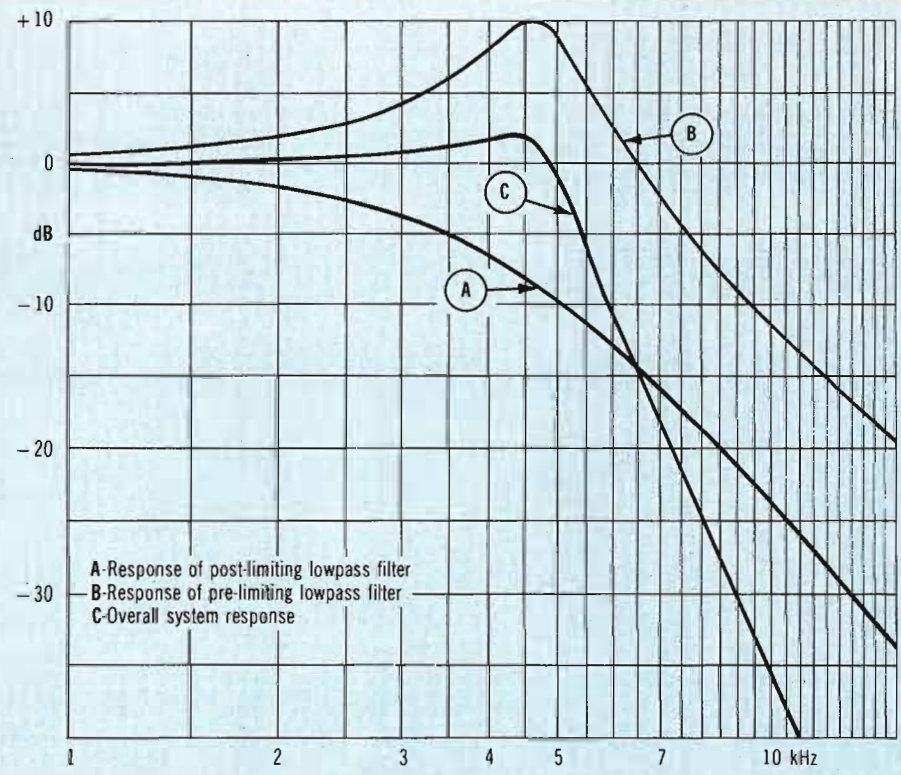

Figure 1 Amplitude Responses

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Subcarrier deviation

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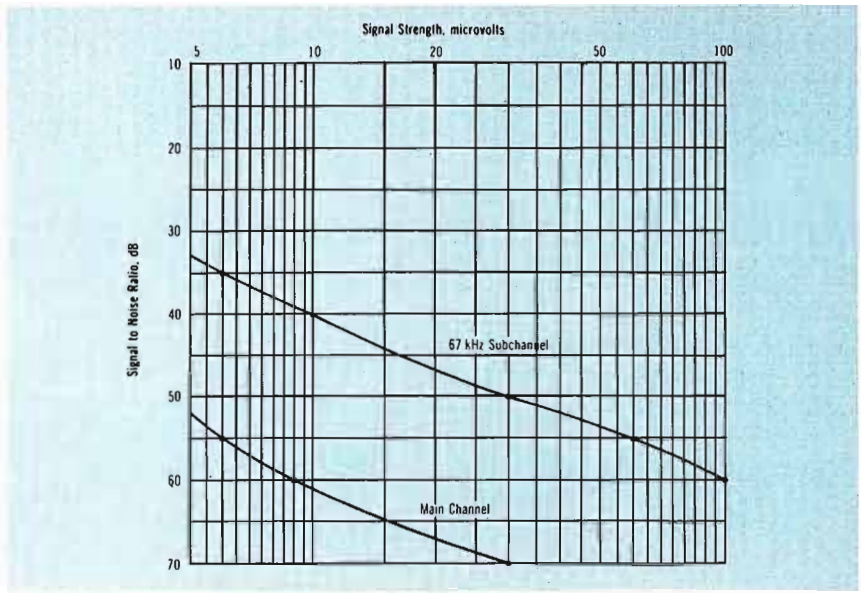

Figure 2 Typical quieting of SCA receiver.

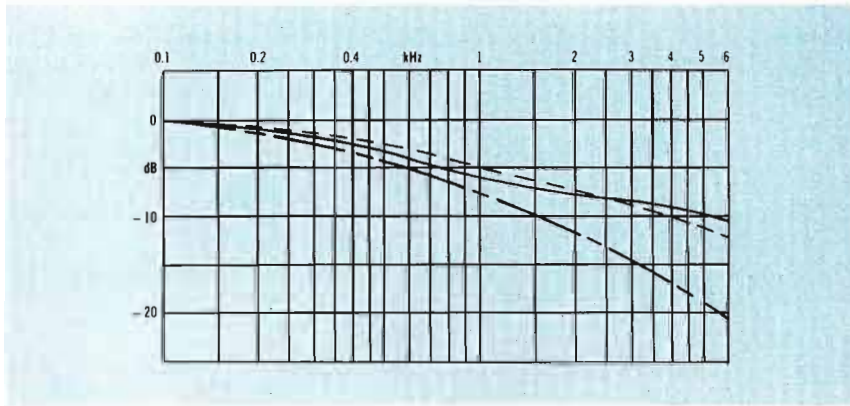

Figure 3
Frequency responses of available SCA receivers. SCA generator used precision 150-microsecond pre-emphasis.

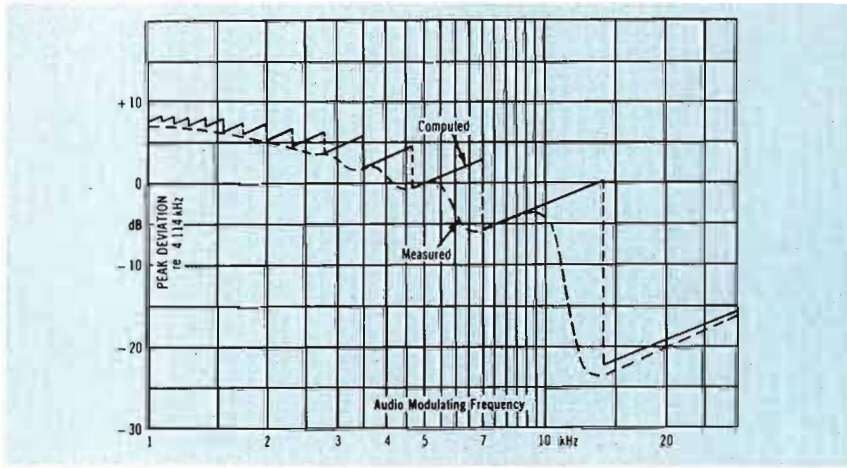

Figure 4
Maximum allowable deviation of 67kHz SCA subcarrier during stereo transmission.

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Subcarrier deviation

continued from page 74

limiter. If the audio applied to the limiter is preceded by a network whose frequency response is as shown in Figure 4 trace B, then the overall system response at levels below the limiting threshold(s) will be as shown in Figure 4, trace C.

When the limiting and filtering system (as described) is installed, there will be found to be no need for any other audio lowpass filtering in the SCA generator. Indeed, such filtering may be detrimental to the transient response of the subcarrier deviation-controlling system, allowing overmodulation on a transient basis.

If such a filter is available at no additional cost (e.g., as a byproduct of altering the SCA generator), then it may be installed ahead of the limiter (if of a suitable impedance). In this position it may remove noise which might be on the program source as well as removing high-frequency pilot tones, if present. Under normal circumstances, however, such filtering is of dubious utility.

This particular system of limiting and filtering offers the promise of generally maximized modulation capability of the SCA subcarrier while transmission is in a stereophonic mode. Program signals with an abundance of energy in the 6 kHz region will tend to operate the first section of the limiter, however. In addition, observe that the post-limiting lowpass filter will set a frequency-dependent ceiling on the subcarrier modulation capability. As a result, only 2 kHz maximum subcarrier deviation can be obtained at a modulating frequency of 5500 Hz. Listening tests have shown that this is of minimal importance. At slightly lower modulation levels the system response is flat.

If the limiter output is set so that the subcarrier is deviated 4 kHz

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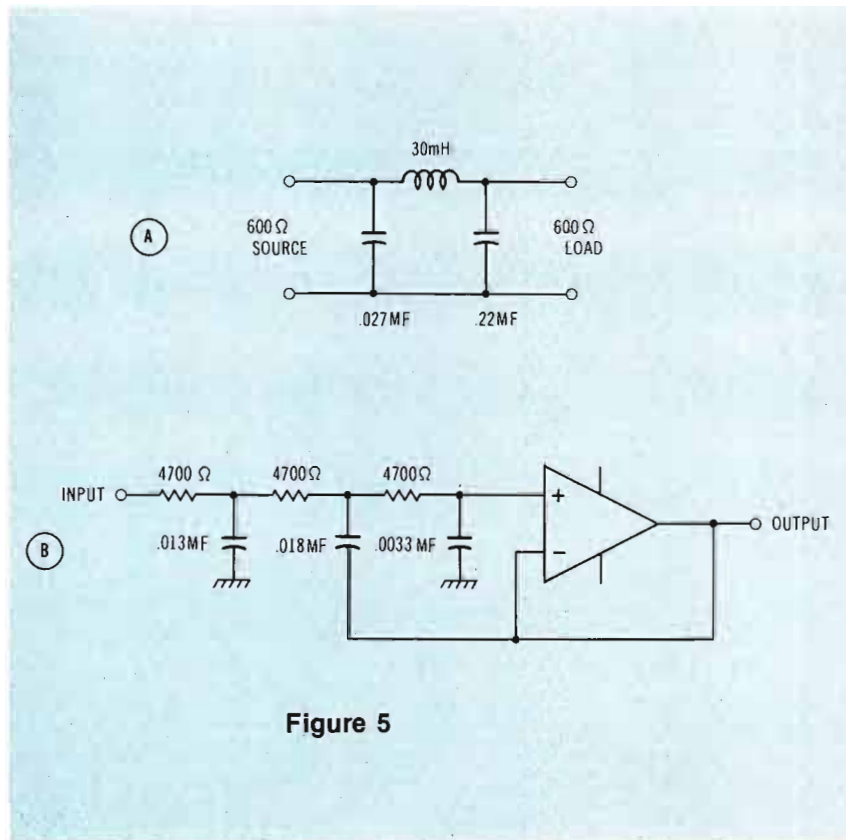

Figure 5

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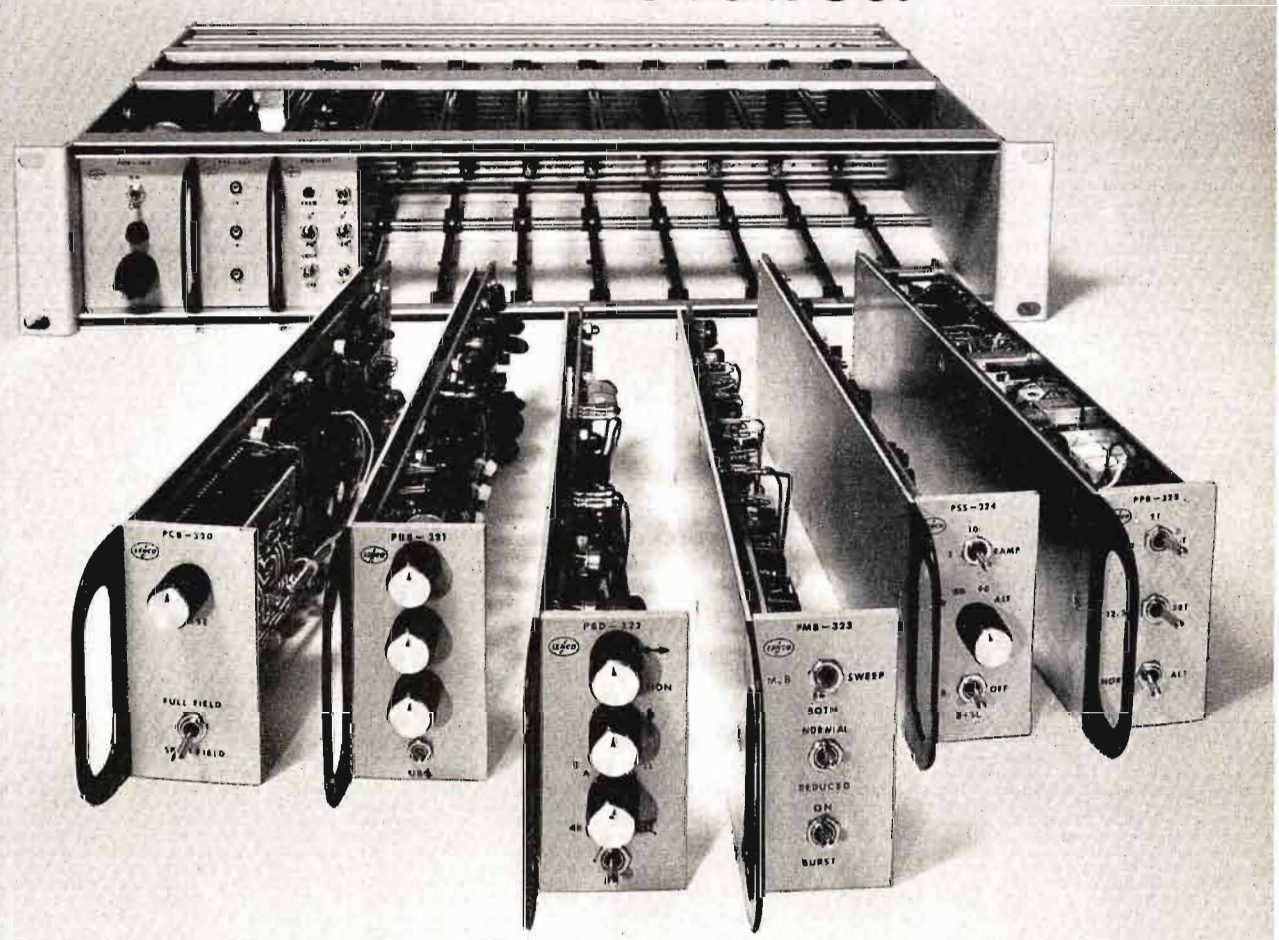

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Subcarrier deviation

continued from page 76

peak at a modulating rate of 3500 Hz, then nearly 8 kHz peak deviation will result at low modulating frequencies. It is this capability that offers a significant increase in the loudness of the audio as delivered from the subcarrier receiver.

In the system as described, nothing has been done to attempt correction of the subcarrier receivers' rolled-off, upper-end audio response. This can be done if the pre-emphasis in the high-frequency controller in the limiter has a greater than 6 dB per octave slope. It must be mentioned at this point that a high-frequency controller of the clipping type should never be used for 150 microsecond service: difference - frequency intermodulation distortion will be extreme.

For those who wish to construct their own filters, appropriate schematics are shown in Figure 5 (for the post-limiting filter) and Figure 6 (for the pre-limiting filter). Both passive (inductor - capacitor) and active (opamp - capacitor) versions are shown. The two versions of each filter are identical in performance, in spite of tales by the ignorant swallowed by the gullible.

Figure 7 illustrates the total concept as presented.

A step-by-step installation would then be as follows:

1. Prior to the limiter, install the response-correcting lowpass filter, whose response is shown in Figure 4, trace B. Either of the circuits shown in Figure 6 will be satisfactory.

2. Use an FM-type (frequency-conscious) limiter, set up for 150-microsecond pre-emphasis. Do not use de-emphasis on the output of the limiter.

3. After the limiter, install the spectrum-shaping lowpass filter, whose response is shown in Figure 4, trace A. The circuits shown in Figure 5 are suggested. Some limit-

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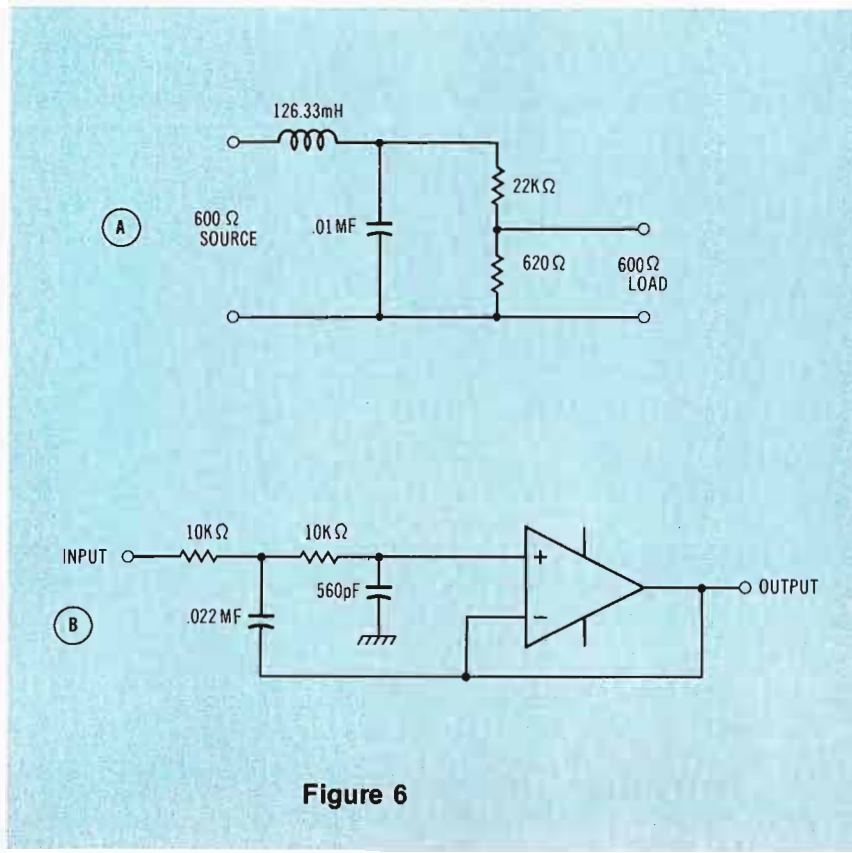

Figure 6

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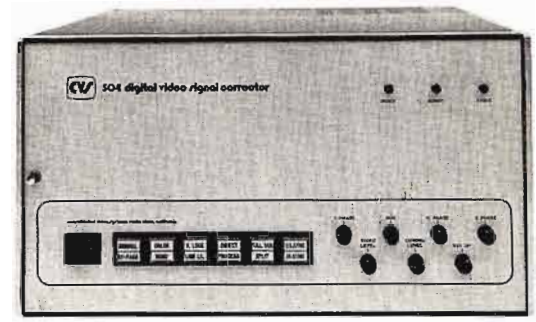

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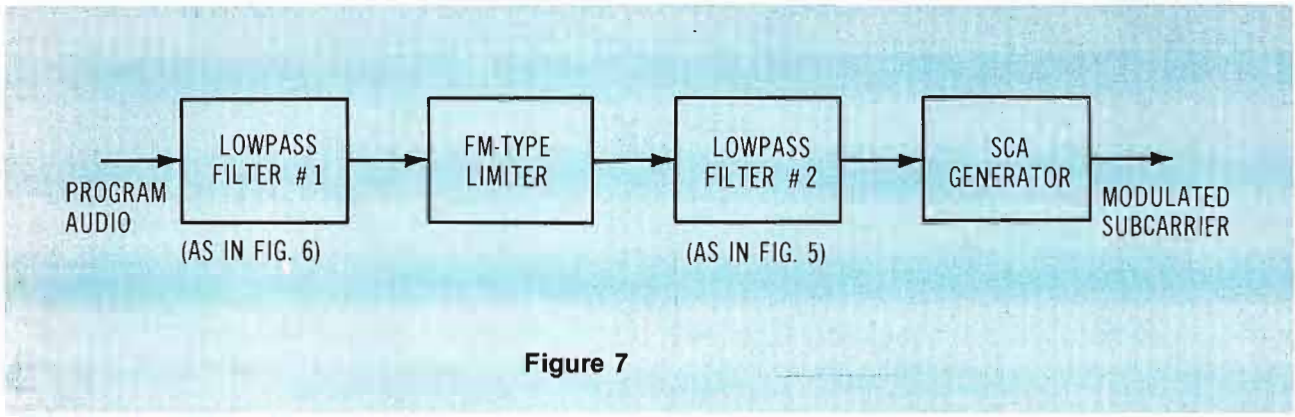

Figure 7

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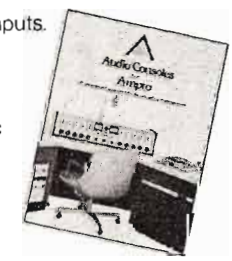

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Subcarrier deviation

continued from page 78

ers have provision for plug-in output networks; if so, the filter is installed at that point. Or that filter can be installed in the SCA generator.

Operate the SCA generator without pre-emphasis and without the customary (or at least common) 5 kHz lowpass filter. Such filtering, although useful in some other circumstances, is of no particular benefit in this system.

5. Adjust the limiter's input level control for the desired degree of limiting, perhaps 5 to 10 dB on peaks of frequent recurrence. Set the limiter's output level control for a subcarrier deviation of 4 kHz at a modulating rate of 3.5 kHz. Under these circumstances the subcarrier deviation will approach 8 kHz at the lower audio frequencies. If this is in excess of what the monitor can handle, reduce the limiter's output level control until the monitor can accept the deviation, which in some cases may be as little as 7.5 or even 6 kHz.

6. While monitoring the stereophonic subchannel with the stereo monitor metering switch in the L-R or subchannel position, sweep the audio oscillator feeding the SCA system from 50 Hz through 15 kHz to demonstrate that there is no crosstalk into the stereophonic subchannel or the main channel, as a result of modulating the SCA generator.

When this system is installed it will be found that the heavier deviation of the SCA subchannel will enhance the signal-to-noise ratio of the SCA system, with a minimum of audible byproducts. □

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Increasing power-grid tube life in FM broadcast transmitters
Part 2

By **Warren Schulz**, chief engineer, WFYR-Chicago

This article concludes a two-part series which began in the August, 1978 issue of **Broadcast Engineering**, *page 58.*

New tube procedure

After you have completed the vacuum-tube logbook entry for a new vacuum tube, you are ready to place it in service. Unfortunately, the only "tube tester" you have is the transmitter. Several precautions should be taken before you attempt full-power operation with a new tube. First, operate the new tube for about 30 minutes at full-rated filament voltage only. While this time is passing, check the grid current meter. Since most transmitters have bias applied when the filament is on this, it is a good chance to check for a possible internal grid short. Of course, the grid current meter should read zero provided no RF is applied. If RF is applied you will see a normal and stable reading.

After the 30 minutes you are ready to apply voltage. Star with the stage's power control at its lowest point. Advance the control so that the tube is operating at about 50% of its normal plate current level. Continue this reduced voltage/power operation for about 15 minutes. After 15 minutes of stable operation you are ready to operate the stage at normal level.

If these precautions are not followed, you may find that a gas formation will cause a flashover. While the internal flashover may not harm the tube, it can cause failure or related circuitry to the tube. This break-in procedure should be followed any time a vacuum tube has been out of service for more than three months.

Can you run a hot standby transmitter?

Probably not. I attempted to operate a Harris FM10H3 transmitter in the filament "on" condition continuously. After about three weeks with filament on a new 4CX300 tube, it was rendered useless. After some discussion with Bill Massey, then service manager at Harris, I received a very reasonable answer as to the cause of the failure. The explanation was that when the oxide cathode is at operating temperature, metalic barium is being evaporated from the cathode and being deposited on cooler surfaces of the inside of the tube.

When only the filament voltage is applied, the coolest part of the tube is the ceramic cylinder forming the insulation between the plate and screen. This metalic plating on the inside surface of the ceramic increases the plate capacitance to the point that the tube will no longer function at VHF frequencies. It was interesting to note that after the first week of filament "on" condition, the transmitter power output dropped when the plate was turned on. However, it was possible to restore normal parameters by retuning the IPA plate circuit. By the second week it was impossible to restore normal readings by tuning the IPA tank circuit.

It was Massey's suggestion that the filament voltage be reduced to between 5.2 and 5.5 volts for the 4CX300. He felt that the 6.0-volt level specified by the manufacturer was a compromise between best tube life and acceptable warm-up time. It then would be practical to use a lower filament voltage, providing the warm-up time was not a factor when operating the tube in a continuous manner. However, even with reduced filament voltage, it was indicated that it would be desirable to operate the transmitter frequently so that the barium would be driven off the insulator surfaces. After ruining several new and used 4CX300 tubes in attempting to operate a hot standby transmitter, I gave up. I did reduce the filament voltage to 5.2 volts. As of this date it has resulted in at least double the tube life for the 4CX300 IPA.

Physical maintenance

For the external-anode power-grid tube, it is a good practice to wash the external anode in soap and water. The tube should be rinsed in clear water to remove any soap film. The insulating surfaces should be clean and free of any foreign matter. Keeping the fins clean can be assisted by a compressed-air. The tube socket should be kept in good condition.

continued on page 86

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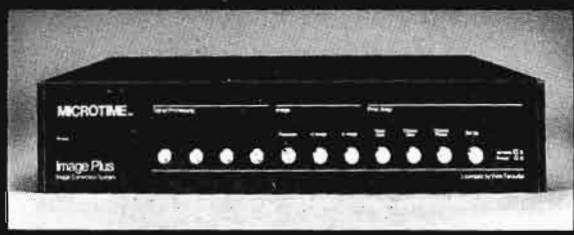

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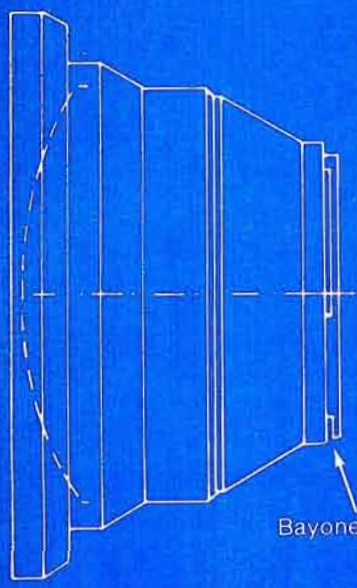
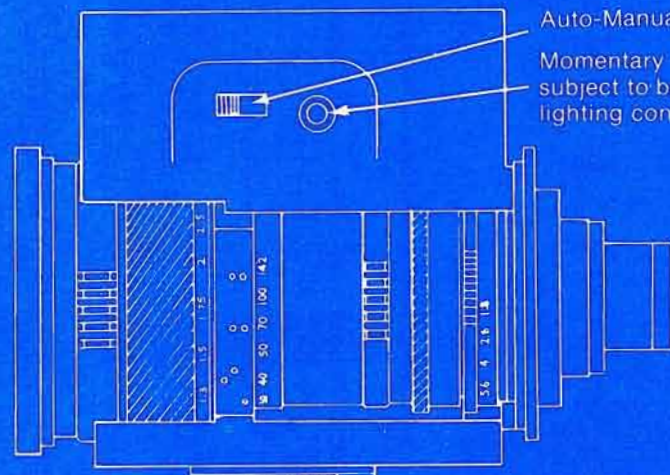


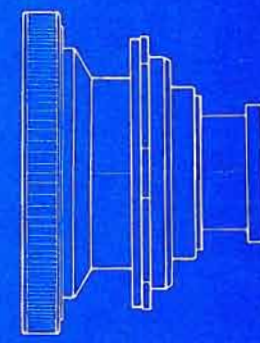
Bayonet mount.

Retrozoom: Front bayonet mount.
Maximum horizontal angle: 70°
Changes focal length to 7 — 105mm retaining f/1.8 aperture.
Retains full zoom capability.
M.O.D.: 0.30 meter (1 foot).



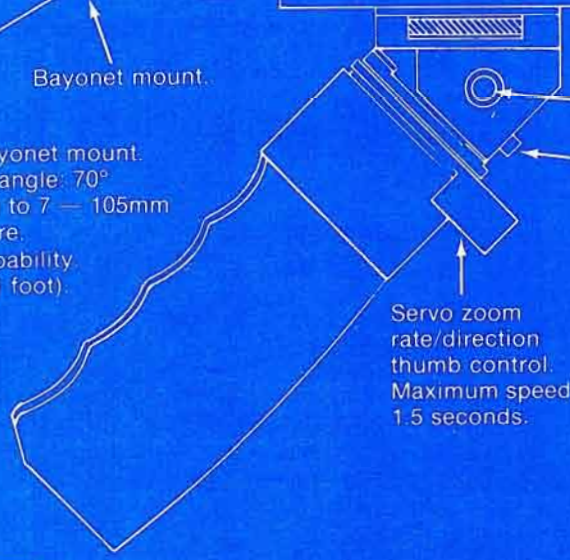
Auto-Manual Iris switch

Momentary Auto Iris button for subject to background differential lighting conditions.



Range Extender

1.6X Range Extender changes focal length to 15 — 225mm, f/2.9 (see Note A above).

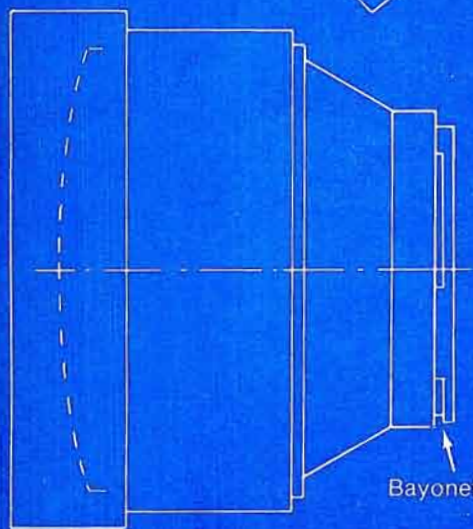


VTR Switch

Servo/manual zoom switch enables either servo or manual zoom operation.

Servo zoom rate/direction thumb control. Maximum speed: 1.5 seconds.

Detachable **Pistol Grip.** Adjustable forward and back for proper balance of camera on shoulder. Accessory bracket available for adjustable angular rotation.



Bayonet mount

Tele-attachment: Front bayonet mount.
Minimum Horizontal angle: 2°
Provides 40 to 240mm zoom capability without changing geometric aperture.

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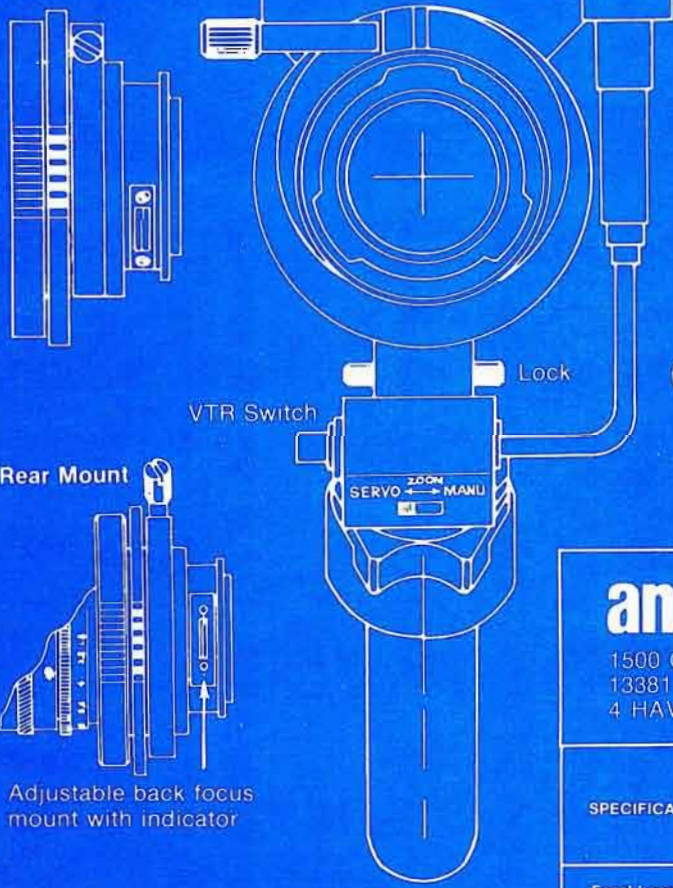
Range Extender

Note A

Second Range Extender (1.6X) may be mounted in tandem providing 2.56X factor, changing focal length to 25 — 365mm, f/4.6

Accessory Focus Control outlet available to accept flexible cable for manual focus hand control.

Rear Mount

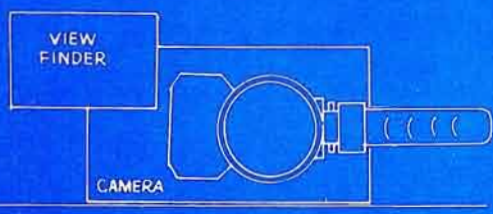


Manual focus hand control for rear-camera operation.

Accessory attachment utilizes **servo zoom pistol grip on pan handle of tripod for studio mode operation.**

Rear Mount

Adjustable back focus mount with indicator



The camera can be placed on its side without interference from the lens.

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SPECIFICATIONS	BASIC LENS	WITH RETROZOOM	WITH TELE-ATTACHMENT	WITH 1.6X RANGE EXTENDER	WITH TELE-ATTACHMENT AND TWO 1.6X RANGE EXTENDERS
Focal Length	9.5 - 142mm	7 - 105mm	40 - 240mm	15 - 225mm	41 - 615mm
Continuous Zoom Range	15X	15X	6X	15X	15X
Maximum Aperture	f/1.8 - f/2.6	f/1.8 - f/2.6	f/1.9 - f/2.6	f/2.9 - f/4.2	f/4.7 - f/6.7
Photometric factor	1.20	1.27	1.27	1.24	1.35
Minimum Object Distance	0.60m 2 ft.	0.30m 1 ft.	1.50m 5 ft.	0.60m 2 ft.	1.50m 5 ft.
Horizontal Angle of View	54° - 4°	70° - 5 1/4°	9° - 2°	34 1/2° - 2 1/2°	3 1/2° - 1°
Vertical Angle of View	41° - 3°	53 1/2° - 3 3/4°	6 1/2° - 1 3/4°	26° - 2°	2 1/2° - 3/4°
Smallest Object Field	27 X 35mm 1.1 X 1.4"	20 X 26mm 0.8 X 1"	46 X 60mm 1.8 X 2.4"	17 X 22mm 0.7 X 0.9"	18 X 24mm 0.7 X 0.95"
Weight of Total Package: lens, iris/zoom, servoes, pistol grip, mount and attachments	2.5 kg 5.5 lbs.	3.8 kg 8.4 lbs.	4 kg 8.8 lbs.	2.7 kg 6.0 lbs.	4.6 kg 10.1 lbs.

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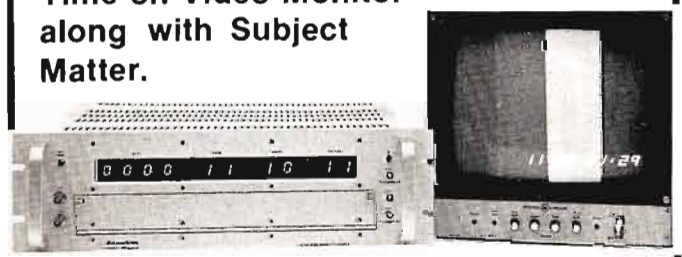
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Tube life

continued from page 82

Compressed air and a small paint brush will do an excellent job of keeping the insulators and socket components clean.

Generally, a clean transmitter is a trouble-free transmitter. Keeping the insulator surfaces free of foreign matter will help reduce the possibility of flashovers and the resulting damage of such an occurrence. I have been using an industrial-type 1HP, 12-gallon, storage-tank, air compressor with an OSHA approved nozzle for transmitter clean-up. This has proven to be very effective in keeping the transmitters in "like new" condition.

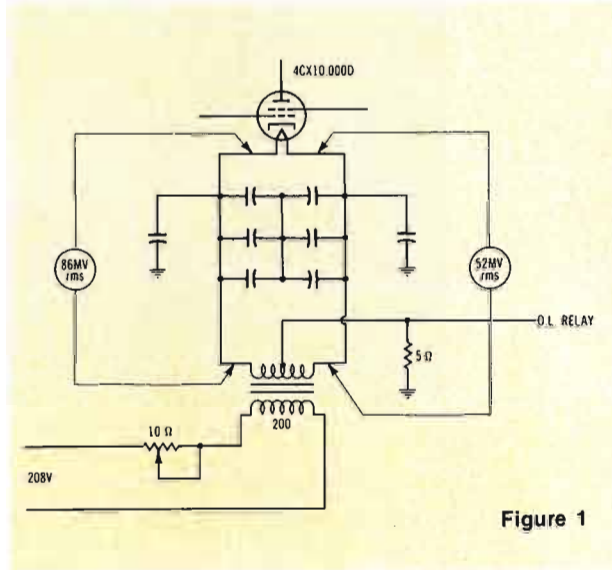

Figure 1

Summary

In conclusion, I would suggest obtaining an accurate method of determining filament voltage beyond that provided by the transmitter manufacturer. This secondary standard should be accurate to 2 or 3%. The secondary standard shall be used to determine the accuracy of the transmitter metering. Then the filament should be optimized for best life.

It is important to keep accurate records since the tube life for a 4CX15000 can run from 6 months to 3 years depending on how you treat it. The tube logbook is the best method as compared to searching through years of maintenance logs. □

References

1. R.I. Sutherland, "Care and Feeding of Power Grid Tubes", Eimac Division of Varian, 1st Edition, 1967, Pages 14-17, 142-146.

2. Engineering News Letter, "Life vs. Filament Voltage", Eimac Division of Varian, September 20, 1965.

3. M.W. Massey, Service Manager, Harris Corp., Letter to Warren Shulz regarding filament voltage for 4CX300A, October 23, 1975.

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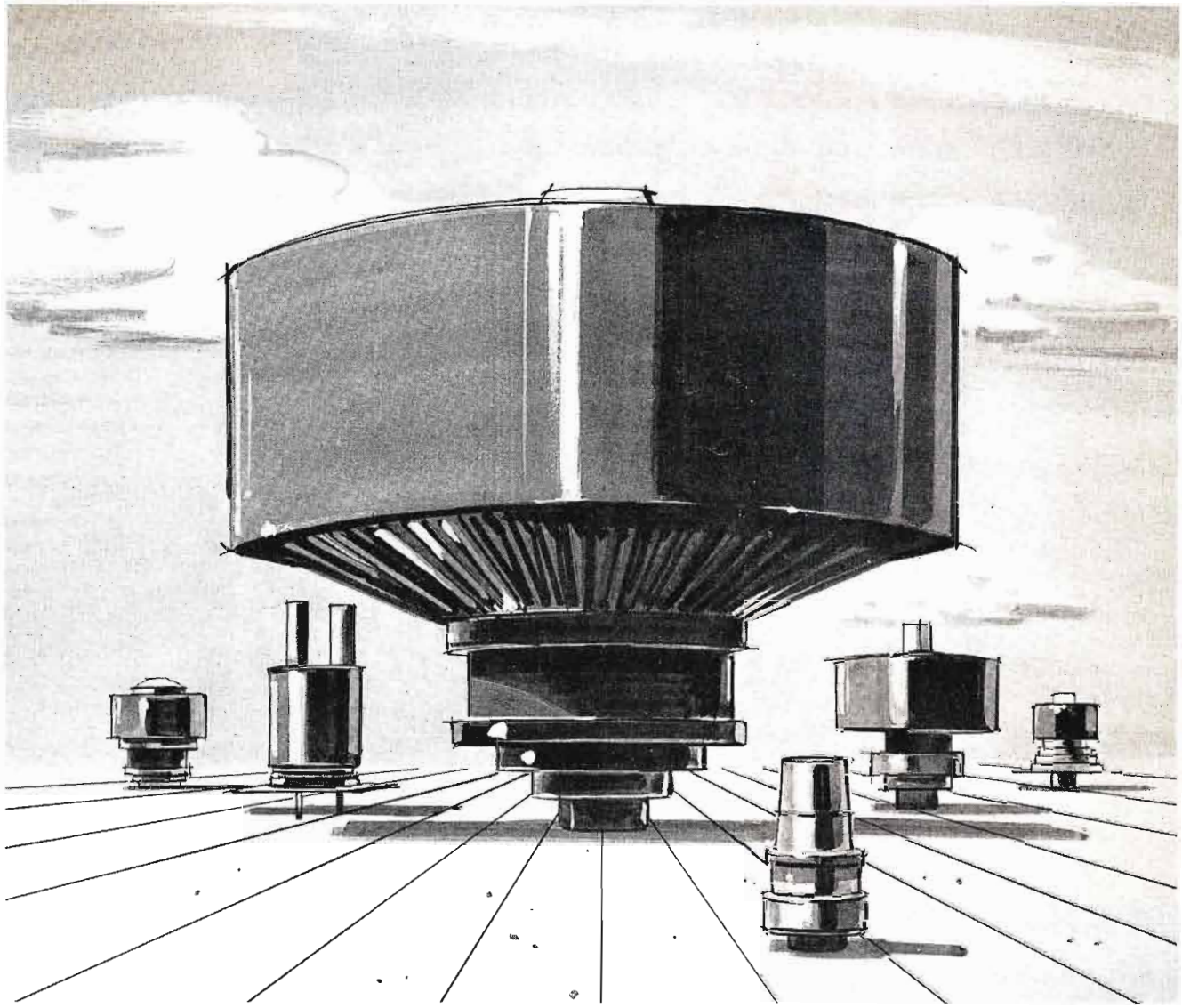

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The importance of time code in computer assisted editing systems

By Arthur Schneider

There have been too many times I have encountered post-production problems because of poor time code on videotape. By the time a code problem is discovered, it may not be too late to correct, but the inconvenience and cost involved can become outrageous.

Drop and non-drop

A question frequently asked is "What is the difference between drop and non-drop frame time codes?" Time code is an electronic method of identifying television picture frames, similar in concept to film edge numbers in use. The most popular use of time code is in making electronic edits by locating a particular spot on the tape. This is accomplished by searching, parking (stopping), cueing and synchronizing and finally making the edit-all based on time code.

Time code editing first appeared in 1967 and one of the first manufacturers to utilize time code for editing was a company known as EECO. For many years, time code editing was generically referred to as EECO editing because of its popularity and the ease with which edits could be made. Time code numbers could be written down and referred to later, which was not the case with electronic editing systems that used beeps or tones to trigger an edit.

Even though the term SMPTE time

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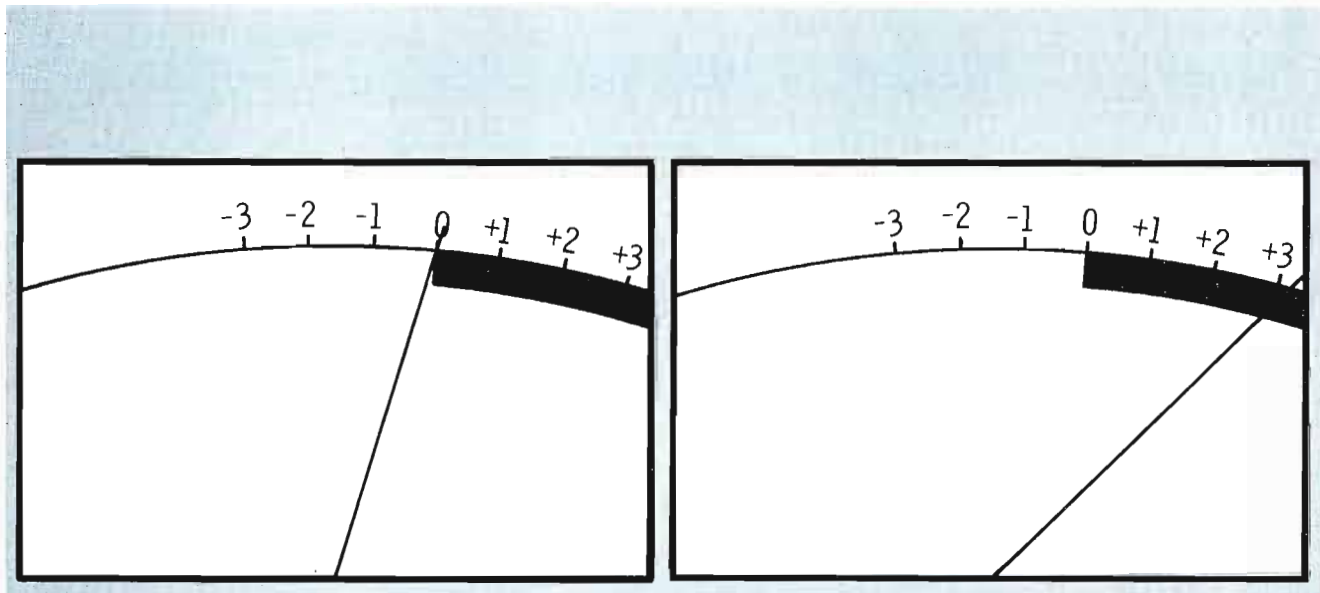

Channel 1: Audio at zero level reference

Channel 2: Time code at +3 dB

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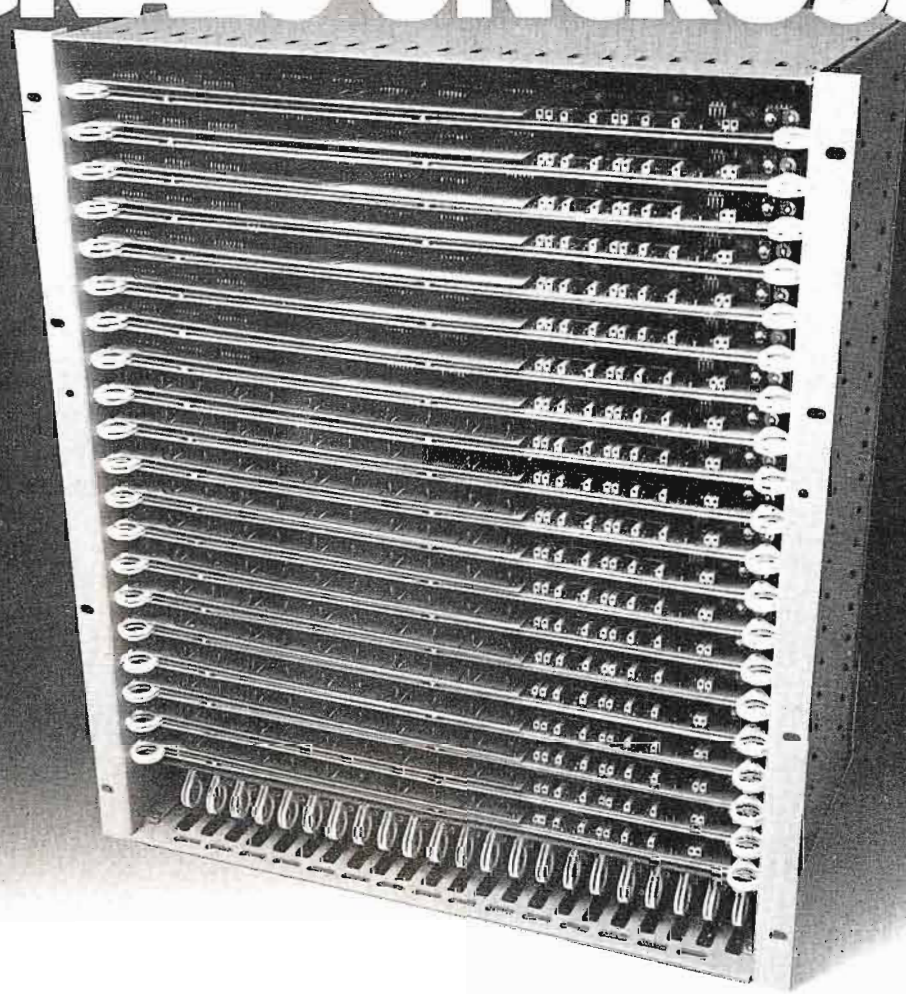

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Time code

continued from page 88

code has generally replaced the term EECO, some people within the industry still refer to computer-style editing as EECO editing. However, true EECO format time code does not have the flexibility of present-day SMPTE time code, so the SMPTE standards committee evolved a more detailed form of time code containing 80 bits of information per frame which also allows the addition of user bits (which will be covered later).

When time code first appeared, it was called continuous time code, later to be called color time and now called non-drop frame time code. This is because the time code is recorded at the television color frequency which makes the tape and the time code 3.6 seconds longer each hour. This caused no end of confusion at the television stations that broadcast these tapes because if an hour show was edited and timed using time code as a timing reference, an hour show would play back 3.6 seconds longer.

In order to solve this problem, the SMPTE standards committee came up with a new form of time code that would compensate for this 3.6 second increase each hour. This format was called drop frame time code. The committee decided to eliminate a certain number of frames each hour to shorten the time code and make it match clock time. Since 3.6 seconds equals 108 television frames, this number would have to be eliminated from the time code

continued on page 92

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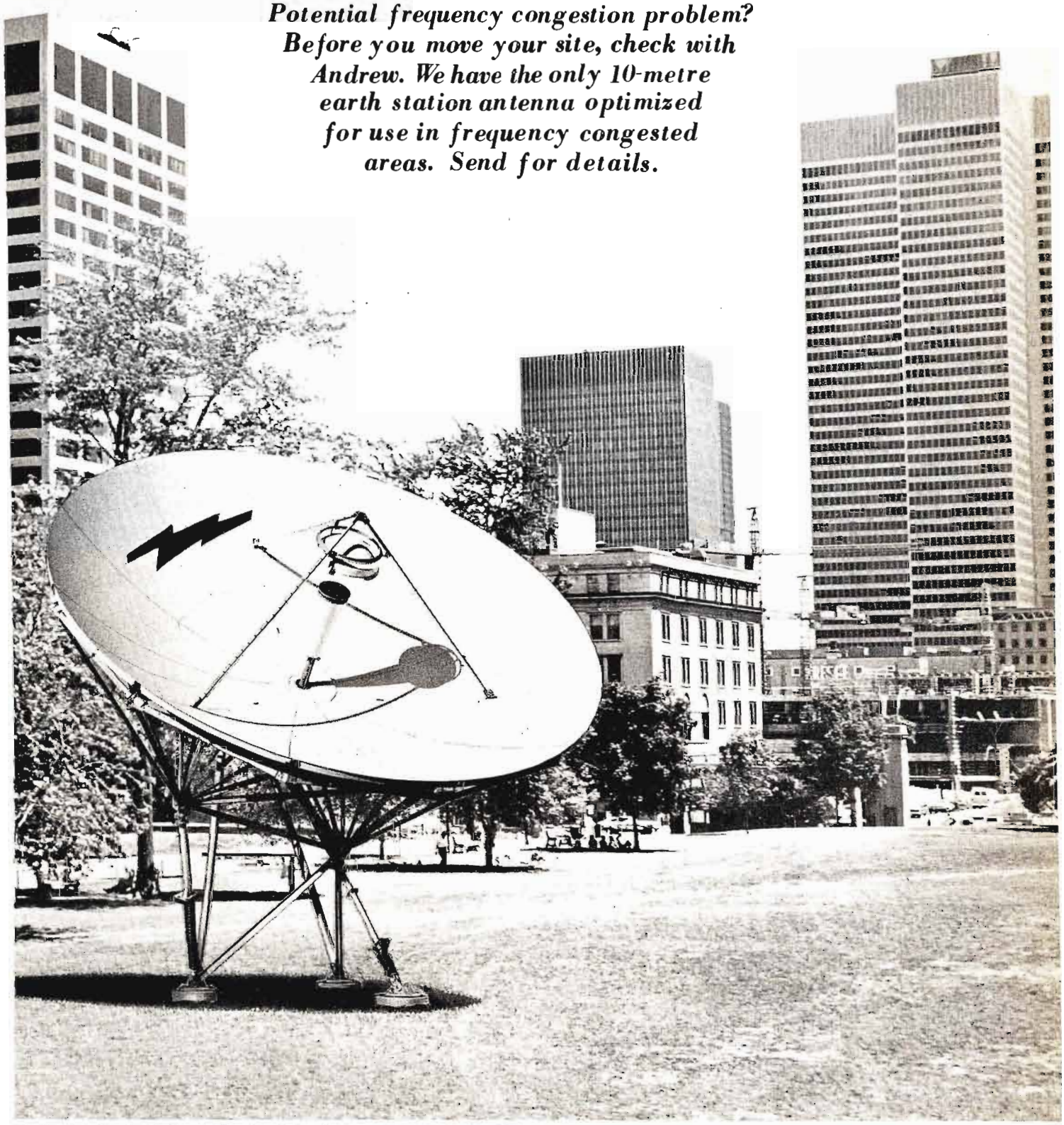

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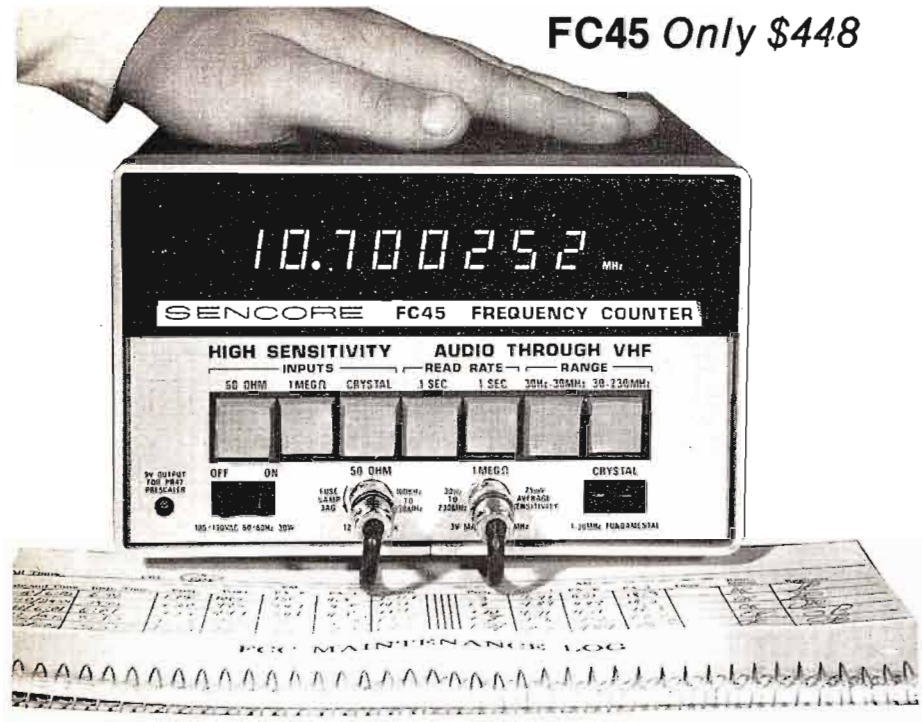

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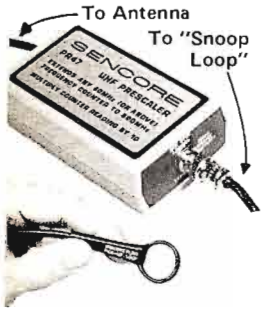

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Time code

continued from page 90

each hour. So, two frames per minute were dropped each minute every hour around the clock except every tenth minute.

The reason is that if two frames were dropped every minute every hour, 120 frames would be dropped instead of the needed 108 frames. This frame dropping occurred at only one point in the time code changes from 01:04:59:29 to 01:05:00:00, the time code actually is displayed as 01:05:00:02, skipping frames 00 and 0; which do not exist in drop frame even though the picture frames are consecutive.

This made time code agree with the clock on the wall, therefore drop frame time code is also called clock time.

User bits

Within the past few years has come the introduction of a new feature called user bits. They are available for any purpose the user may desire. In general though, each television frame is limited to 4 letters or 8 digits or a combination of the two. There are occasions when this limitation may be strung out over a period of several seconds or longer which allows the user to include nearly unlimited data. However, one may not be able to read this expanded information unless printed out (on paper) by a computer.

Time code is generated in a form known as a binary code. This means that each letter or number is made up of a series of ones and zeros. One frame of time code representing 1/30 of a second contains 80 bits of binary time code information. Thirty-two of these bits are delegated to represent time in the form of hours (up to 23), minutes (up to 59), and frames (up to 30). Another 32 bits are used for adding alpha-numerics (letters and numbers) to the time code by the user and to designate such things as reel numbers, recording date or any other information that can be abbreviated in 4 letters or 8 digits. The rest of the binary data in the time code is used to determine the type of code and other things not relevant to this discussion.

User bit data must be recorded as the time code is being recorded on the tape and can't be added once

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GENERAL ELECTRIC Large Screen TV Projectors

The General Electric Large Screen Video Projectors incorporate advances in simplicity, reliability and performance in large screen television projection.

This solid-state, high-brightness television projector is engineered for remote control operation; with improved circuit design for enhanced picture quality, power efficiency, and increased ease of operation, maintenance and service.

It utilizes the exclusive GE light valve—single gun, single optical path system which requires no convergence adjustments to faithfully reproduce monochrome and natural color TV pictures of high resolution and contrast.

Built-in remote control capability allows set-up adjustment and operating control at the projector, or from 200 feet away, with the addition of an accessory cable.

APPLICATIONS

In addition to projecting information from all standard video sources such as off-air TV tuner, video tape, video cassette, live camera, closed-circuit data network, video film chain, etc., the versatile system can be coupled to computer facilities through suitable interface equipment. It can project alpha-numeric data, graphic displays and computer generated images in real time.

GE large screen TV projectors are now in use in Business, Industry, Education, Medicine, Military, Government, Entertainment and the Arts.

Business—Instant review and analysis of computer data bank information, stockholders meetings, conferences, presentation of advertising and sales promotional campaigns, sales meetings.

Industry—Safety and Industrial training programs.

Military—Command and control displays, computer readout, dynamic visual simulators, tactical and operational situation displays.

Medicine—Teaching surgical techniques, medical procedures, nursing, training and consultation conference information displays.

Entertainment—Sports, CCTV, standard TV, concerts, box office extensions.

Education—Off-campus programs and seminars, demonstration of the arts, teaching sciences,lecture demonstrations.

"Thousand" Series Projectors. (PJ500 and PJ700 not shown.)

PERFORMANCE FEATURES

- High efficiency power circuits permit operation at low line voltages without affecting picture quality.
- Low input power . . . 1,200 watts compared to 1,700 watts or more for other professional television projectors.
- Operates from standard 120v/20 amp appliance outlets.
- No radiation hazard. Highest voltage used is 7,200 v.
- LED circuit monitors and beam current meter included.
- Sweep reversal switches allow easy projected image changeover for front or rear screen applications.
- Variable picture size from 2 to 20 feet in width.
- Versatile projector mounting includes table top, gimbal, or on its matching, accessory base.
- Accessory rolling base allows easy transportability.
- Afocal lenses available to vary projection distance from standard 3.0:1 (throw distance to screen width) by factors of 2 or ½.

GE Large Screen Television Projector Specifications

Model	Projector Type	Minimum Output (in lumens)	Power Supply	Video Input & Standards	Price*
PJ500**	Color	220	60 Hz, 117 v., ± 10%	NTSC & RGB	$35,000
PJ700**	Monochrome	600	60 Hz, 117 v., ± 10%	525 lines/60 f.p.s.	$30,000
PJ5000	Color	220	50/60 Hz, 117 v., ± 10%	525 lines/60 f.p.s. or 625 lines/50 f.p.s., NTSC & RGB	$55,000
PJ5100	Color	220	60 Hz, 117 v., ± 10%	1023 lines/60 f.p.s., RGB	$72,500
PJ5800	Color	220	60 Hz, 117 v., ± 10%	875 lines/60 f.p.s., RGB	$72,500
PJ7000	Monochrome	600	50/60 Hz, 117 v., ± 10%	525 lines/60 f.p.s.	$48,500
PJ7010	Monochrome	600	50/60 Hz, 117 v., ± 10%	625 lines/50 f.p.s.	$48,500
PJ7050	Monochrome	1000	50/60 Hz, 117 v.,±10%	525 lines/60 f.p.s.	$53,500
PJ7100	Monochrome	600	60 Hz, 117 v., ± 10%	1023 lines/60 f.p.s.	$52,000
PJ7150	Monochrome	1000	60 Hz, 117 v., ± 10%	1023 lines/60 f.p.s.	$57,000

**used/factory refurbished

*effective 1/78

Video Display Equipment Operation
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Phones: (315) 456-2562/2533/2179

GENERAL ELECTRIC

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the time code has been put on the tape. So it is up to the tape operator or someone on the production staff to provide information to be recorded in the user bit area of the time code.

User bits may be very helpful in identifying reel numbers or providing other useful information. However, everyone must use it on a consistent basis. It does no good to have some reels with user bit information and others without it.

One of the most common methods of editing musical numbers is to put time code on an audio playback device and transfer that code information to the videotape. However, if the same section of audio is played back repeatedly, the time code is also copied to the videotape an equal number of times.

In order for a computer-assisted editing system to identify the correct take, a user bit code may be inserted in the time code on the audio track. Then, as the time code of that take is repeated over and over again, time of day code is also transferred on a continuous basis so that each take now contains a second reference code. This time code information may be included in the vertical interval of the video signal, in effect, giving two different codes, one repeating and one in ascending order.

Editing systems have been developed that rely exclusively on user bits for reel identification, relieving the editor of having to type in the proper reel number each time a reel of tape is changed. The system does it for him by selecting the reel number from the user bit information and entering it into the computer's memory.

In addition, there are editing systems that have the ability to edit with SMPTE time code, tape timer or user bits. Until recently, user bits were not in wide use because of the lack of standardization and equipment to generate and display this type of data.

Keeping it clean

In order to achieve optimum recordings on videotape, the VTR tape path must be cleaned thoroughly. This includes all audio, video record, play and erase heads as well as the path that the tape takes during record and playback.

Dirty heads may cause low levels, distortion or no signal at all in severe cases. Don't take it for granted that the last person using the machine cleaned it. Only a few minutes of care will prevent these problems.

Nearly all present-day computer assisted editing systems use channel 1 (left channel) to record program audio and channel 2 (right channel) to record time code. Channel 1 audio is recorded in the normal manner. Channel 2 is used to record SMPTE time code at 3 dB above

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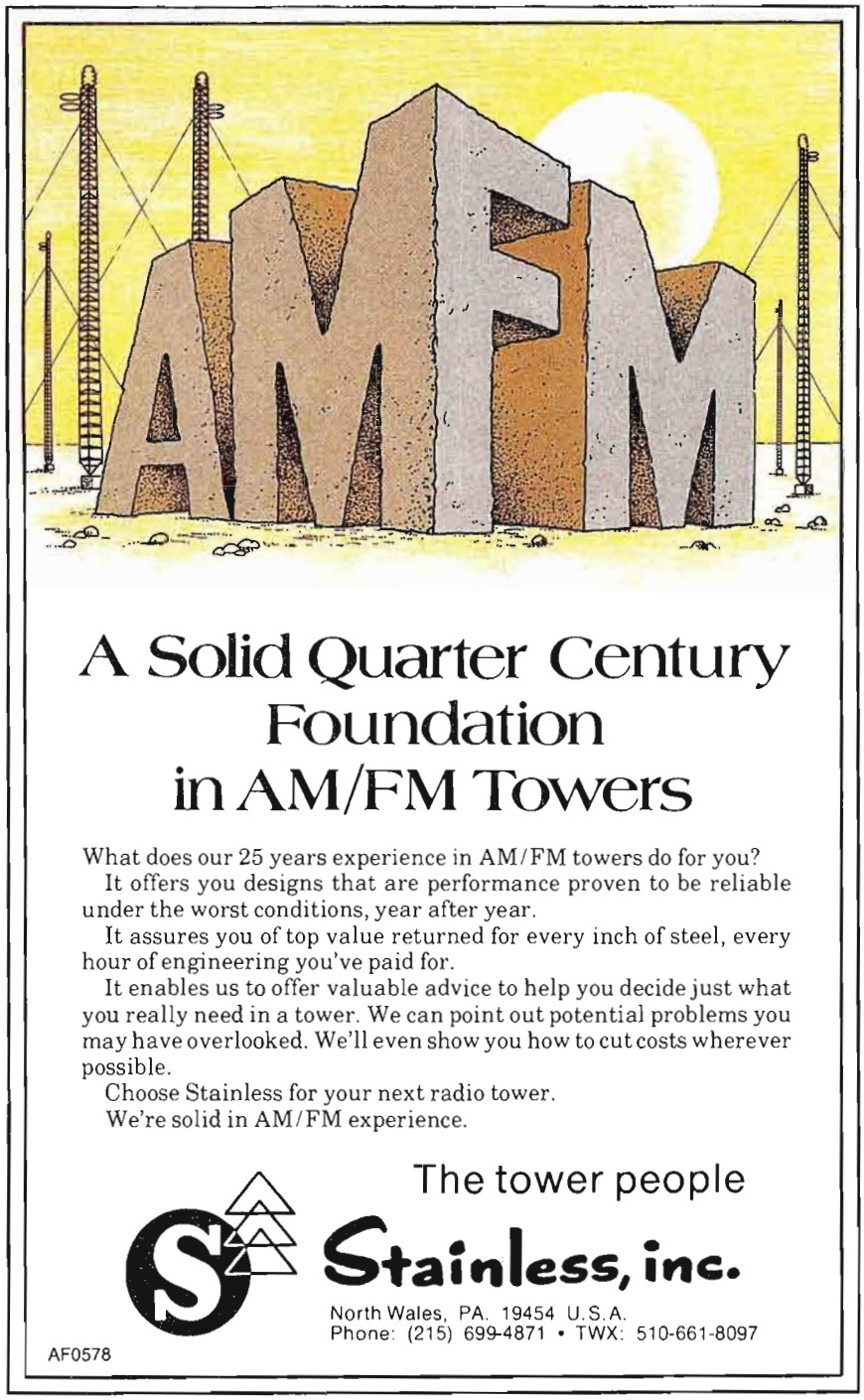

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zero level. That is, the time code should record and play back 3 dB above the zero level reference mark on the VU meter.

These levels will give optimum performance during computer assisted editing. Time code may be recorded at levels below 3 dB, but searching, cueing and time code readability may be impaired in some systems. Still others may accept time code levels as low as -5 dB, but only if the quality of the time code is good. If consistency is maintained when recording time code, chances of encountering problems on virtually any system are slim.

Avoiding problems

The most serious problem encountered in time code editing is that of poor quality time code. This may be caused by a number of things, such as dirty audio heads, distortion introduced into the time code channel by defective amplifiers or attempts to duplicate time code without proper signal processing. Misaligned audio heads are another source of low level or distorted time codes. Audio head alignment is a maintenance function and should be checked with a master alignment tape provided by the VTR manufacturer.

Occasionally, audio amplifiers may become overloaded by feeding excessive levels into them. This almost always causes distortion in the time code signal which is signified by erratic reproduction of the time code. The solution is to use high quality audio amplifiers and distribute the code without overloading the system.

Another problem that occurs frequently is distortion created by feeding the time code into an AGC (Automatic Gain Control) amplifier or through an audio limiter. No constraints should be put on the time code signal being recorded on videotape.

A term frequently heard is jam sync, which means the slaving of time code already existing on a videotape which is re-recorded through a master slave generator onto the same tape in exact synchronization with the existing time code. Jam syncing may be used to correct low level or marginal time code. It is also done by slaving the last recorded time through a master slave clock and when the system goes into record, the time code is synchronized and continues to record until the end of the recording. This process continues until the edited tape is completed at which time a continuous time code track has been laid down.

Duplicating time code—When copying time code from one tape to another, the safest way to prevent distortion is to duplicate the time code through a master slave clock that generates fresh time code in

continued on page 100

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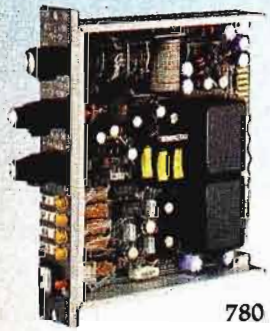

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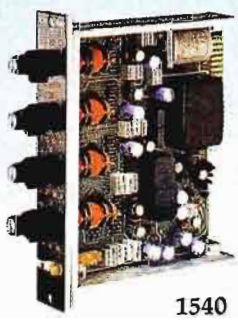

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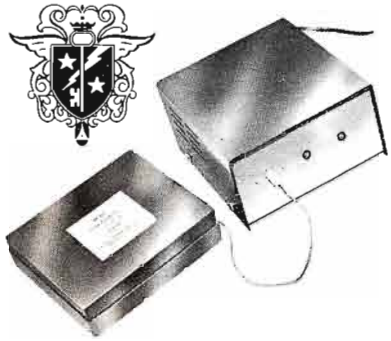

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Time code

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synchronization with the source time code. If the time code reader is equipped to regenerate time code, this too may be used to reshape the time code waveform so that it will read without distortion. It is not advisable to copy time code by any other means except as described here, because the quality will not be adequate for editing. Stressing these facts about distortion may seem redundant, but nearly all time code problems encountered during editing are the direct result of poor quality time code.

Non-synchronous time code—This problem manifests itself in the form of frequent aborts of the edit cycle (either preview or record). The system will repeatedly attempt to make an edit but as the time code approaches the edit point, the code will drift out of frame synchronization and straddles two adjacent frames. The system gets confused since it cannot determine which frame is the correct one. Therefore, it re-cues and tries to make the edit over and over again.

The problem of drifting or non-synchronous time code may occur when the reference signal feeding the time code generator is interrupted. It should also be noted that time code can only be recorded correctly with the VTR referenced to the video signal which is locked horizontally and vertically, otherwise the time code will not synchronize with the television picture frame.

The only way to correct this problem is to re-code that section of tape that exhibits this error. This

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Split Second
Time Machine

The Telex/Magnecord 1400 recorder. Split second timing with a grid of 524 lines passing a quartz crystal control reference each capstan revolution. This senses, and corrects the speed of the DC servo drive some 4000 times per second*. Speed stability is so accurate the National Weather and the Environmental Satellite Services selected Telex/Magnecord 1400's over all others to record meteorological display data.

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may be done by using a master slave clock as outlined earlier and slaving it to a portion of the old code ahead of where it will be used.

Notes and edit logs—Without proper recording logs, editing would be very difficult, to say the least. These notes assist the editor in locating scenes by time code number, noting the good and bad takes and supplying the staff with information relative to editing. Basic information should include: the scene number, the take number, the page number in the script (optional), start time code where the slate first appears, start time code of the scene (action cue), stop time of the scene (where cut is), and comments about the scene. This log should be given to the editor and a copy included in the box with the videotape machine.

It is most important that complete and detailed edit notes be taken. Many production facilities provide a time code reader in the control booth so that during taping the production staff will be able to make notes for editing regarding program content rather than technical comments. Someone is bound to remember a point that someone else may have forgotten.

Time code labels—No matter how accurate the logs are, an improperly labeled tape reel or box may cause many wasted hours of searching for material. Include the following information and be sure it appears the same way on the tape reels as it does on the tape box: show title, show number if in a series, reel number, recorded date, whether master or isolated feed and the ISO camera number, type of time code on the reel, and whether format type A, B or C (1-inch only).

Include in the box any information about tape defects or technical problems in the recording itself. Be sure to immediately notify the proper people of these problems so they can be corrected if necessary. Rewind all tapes prior to returning them to their boxes to prevent transportation damage.

Pre-rolls—Pre-roll is the time or distance ahead of the edit point where all the VTRs involved in the edit, park or stop prior to synchronizing before actually making the edit. Some systems have variable pre-rolls allowing the user the flexibility of seeing more or less recorded material ahead of the edit point.

Even though some videotape machines are able to make frame accurate edits with as little as a one second pre-roll, the majority of VTRs in use today require from 7- to 10-second pre-rolls. To prevent frequent edit aborts, there must be stable video, control track and time code at the pre-roll point. In addition, all servos in the VTR must be adjusted to the manufacturer's specifications.

Videocassette recorders usually require longer pre-rolls than other types of VTRs since the tape must

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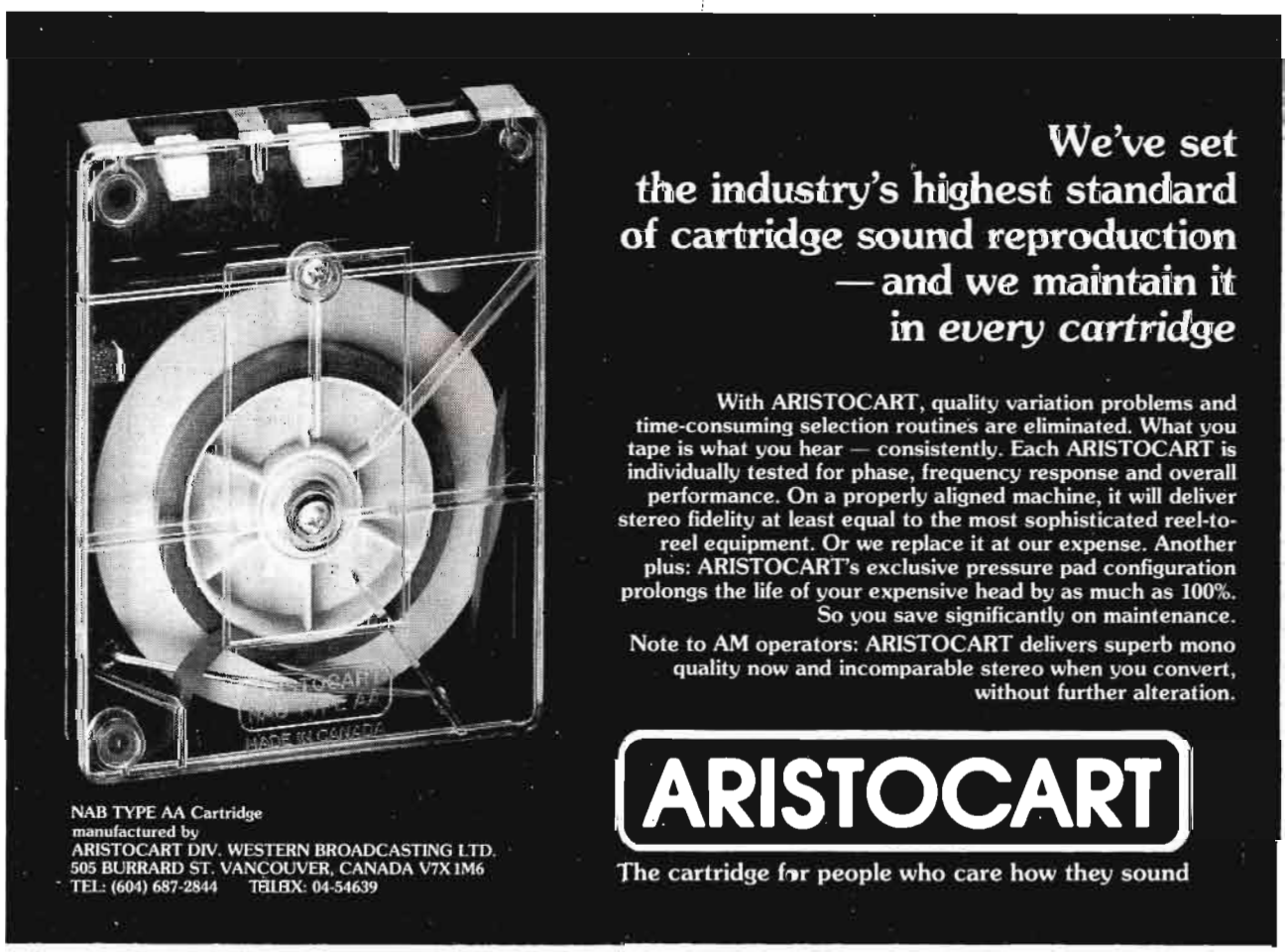

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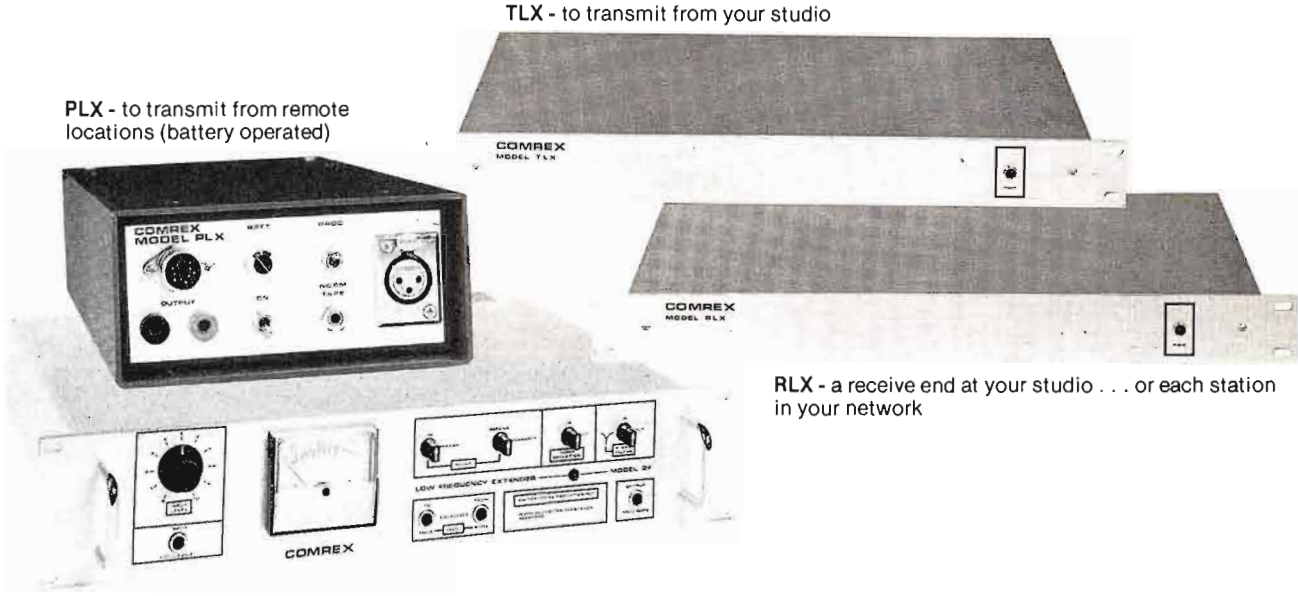
TLX - to transmit from your studio

PLX - to transmit from remote locations (battery operated)



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be withdrawn from the cassette and wrapped around the video head before going into play. This is not true of open reel to reel VTRs. The new design 1-inch VTRs have become very popular for use in editing systems since wind and search time is more than five times faster than videocassette recorders. The average wind speed of a 1-inch VTR is about 30 times play speed while the wind speed of a cassette recorder is about six times play speed.

In post-production, using computer assisted editing systems, it is imperative to allow sufficient leader ahead of the first wanted video or audio. This must be done during the original recording. Before notifying the production crew that you have achieved speed, a rule of thumb is to allow about 20 seconds from the time the record button is pressed until the first action cue is given. Videotape stock is relatively inexpensive compared to the frustration that can occur during editing because there is not enough pre-roll time to allow the system to cue up.

The 20-second stabilizing period mentioned before may be utilized to slate scenes as well as final focusing and framing of cameras before the action cue is given. Now there will be adequate pre-roll leader for any type of editing system.

Once the VTR has started to record and as long as it continues to record without stopping, another scene may be slated without having to wait 20 seconds again since the time code, control track and video are being recorded continuously. It is also wise to avoid large gaps of blank tape between takes as this may confuse some editing systems since they sense the absence of time code and may go into rewind looking for code. There should be no more than a 5-second gap of time code between takes.

Recording multiple feeds — There may be occasions when two or more isolated cameras are being recorded at the same time. It is imperative that the tape operator carefully check to see that all of the VTRs involved in the recording session are being fed from the same time code generator and that the code type (drop or non-drop frame) remains the same throughout the recording session — particularly if it covers a period of several days. Some computer editing systems cannot accept mixed time code and this may cause serious problems during editing if mixed.

There are sometimes situations where more than one time code generator is in use at any given time. This is especially true at network facilities and larger television stations because some production people prefer to use elapsed time code while others use time of day. Still others want drop frame code, and yet some people insist on non-drop frame code.

It has happened more than once that one time code generator has been feeding one VTR while a different time code generator is feeding another VTR on the same studio feed because someone has not patched it correctly. It is very difficult to edit with mixed time code under these conditions. Computations by the editor to compensate for the differences may certainly try his patience.

Ascending time code — When starting to record time code at the beginning of a reel, always start with a low number and let the time increase to a higher number.

For example, suppose the operator was using the time of day code and recorded the first take at 9 AM. The first time code recorded on the tape would be 9:00:00. If the recording ended at 3 PM that day, the time code would be displayed as 15:00:00, since virtually all time code generators are 24-hour clocks.

Now, suppose it took until 3 PM to record only 30 minutes of program material on a one hour reel. To conserve tape stock, the operator decides to use the balance of this hour reel the next day. The following day, the operator starts to record where he left off the previous day.

But it happens that the first take the second day starts with time of day code at 9:00:00 AM. The recording process continues until the one hour reel is fully recorded. Now, what obviously has happened is that two sets of identical time codes were recorded on the same reel. How does the computer know which set of time codes the operator really wants?

It doesn't matter what time code number is used first as long as the numbers continually increase in time. If using a partial reel, with the balance to be used at another time, reset the code generator to any number greater than the last number recorded on the reel. This technique requires co-ordination on the part of the production staff as well as the tape operators to be sure the generator is set correctly before starting to record each day.

Another method is to start recording on a new reel, setting the time code generator to one hour. Let it run continuously throughout the day's shooting without changing it until the reel is fully recorded. If recording more than one complete reel each day, reset the time code generator at one hour for every new reel so they are all consistent.

The midnight problem — There is a point on the 24-hour clock that may cause a problem with some computer assisted editing systems. That is, when the clock time goes past 23 hours, 59 minutes and 59 seconds, the clock time will change to 00:00:00, not 24 hours. When attempting to make an edit just past this zero point on the clock, the preroll time must start before zero or somewhere near 23:59:50. The system will abort the edit attempt since it is counting down to the edit point from 23:59:50, but as it crosses over 00:00:00, the system gets confused since it thinks it must rewind towards zero, which in reality is ahead of it, not behind it.

Therefore, the system stops and tries to recue again and again. But it will never be able to make the edit because of this drastic time code change over at midnight. So, if recording near midnight either start the scene before midnight and let it continue after midnight, or wait

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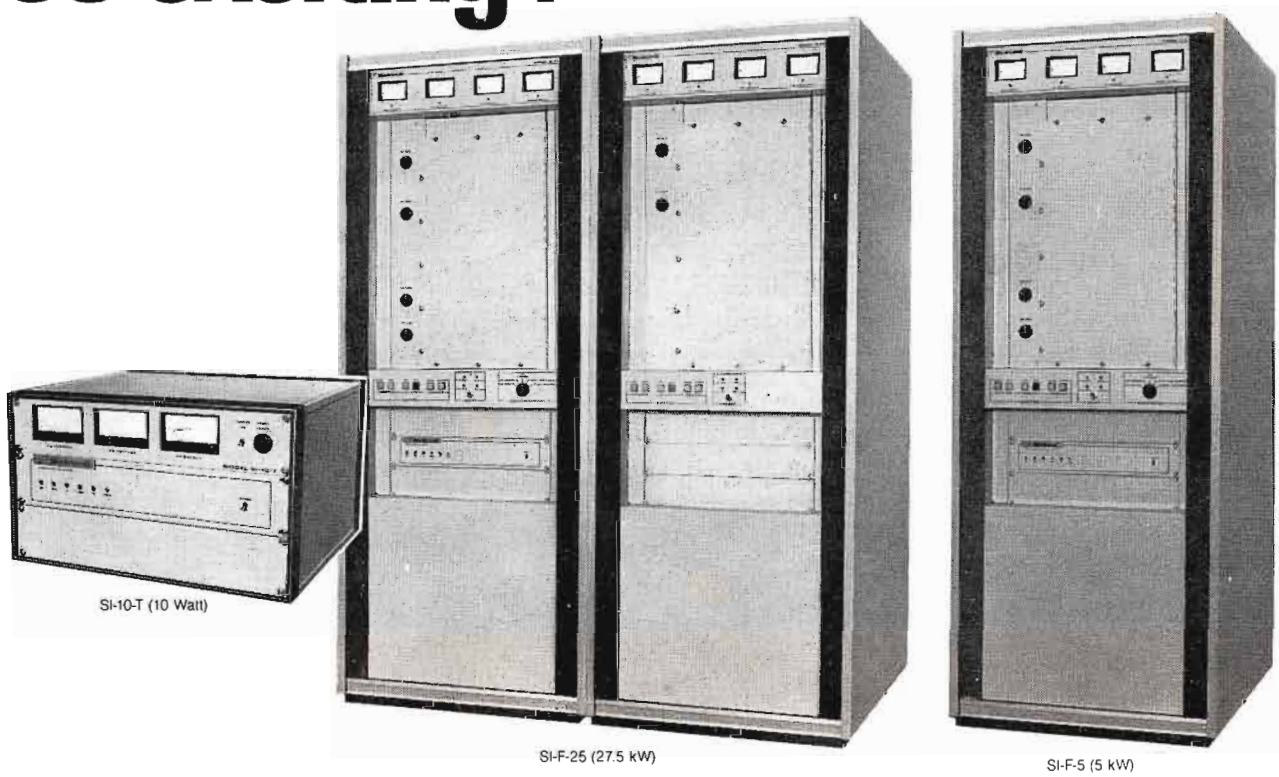
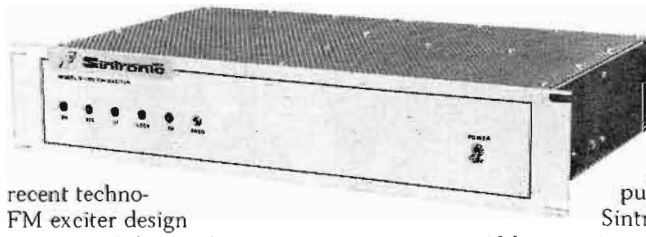


Well for one thing...



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until the clock has changed to zero before starting to record.

Ping ponging audio—Since the accepted standard for computerized editing utilizes channel one to record and play back program material and channel two to record and play back time code, there are times when videotapes used in computer assisted editing have these two channels reversed. Some people record videotapes with audio on channel two. Others may record audio on both channels. In either case, a correction of some sort must be made to provide audio and time code on the correct channels for editing.

This procedure requires the audio, if on channel two, to be re-recorded onto channel one in one operation. Then, in a second pass, time code is recorded on channel two in place of the old program sound. This channel swapping has been given the name of ping ponging.

Correcting tapes in this manner, although effective, is time consuming and expensive. A by-product of ping-ponging is cross talk (interference between the audio and the time code channels) and is heard as a low frequency buzz on the audio channel. This type of interference is usually only found on ¾-inch videocassettes. In addition, the program sound also loses a generation of quality by being re-recorded onto another channel using this method.

Production hints

The following suggestions, if implemented during production, are meant to reduce the possibility of error or extra cost during post production.

1. Specify before taping begins which type of time code is to be used and stay with it. Either drop or non-drop frame time code may be used, but should not be mixed since this may cause problems during editing in some systems.

2. Record program audio on channel one and time code on channel two. The code on channel two should be recorded at 3 dB, which is a recording level reference. This format is used on most major computer assisted editing systems.

3. If time code characters are inserted into the picture on work prints, follow these general guidelines:

- Place the inserted time code numbers in a black box, if the character inserter has this capability. This makes the numbers more legible regardless of video content.
- Don't make the characters too large or they may block out too much picture. Most character generators have 3 or 4 sizes available. Use the size one up from the smallest. Also, don't make the characters too wide; leave room on the screen for characters that may be added during editing.
- Since most character inserters have some sort of positioner, be sure to position the characters in the lower left corner of the monitor.
- A one frame time code error may occur when the characters displayed in the picture do not agree with the time code that corresponds

continued on page 108

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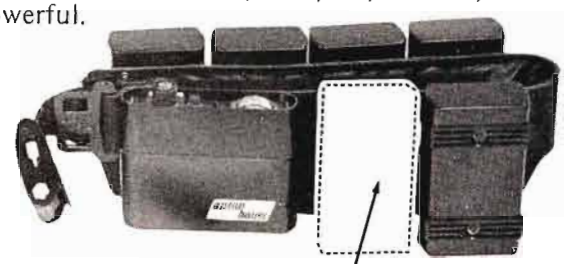

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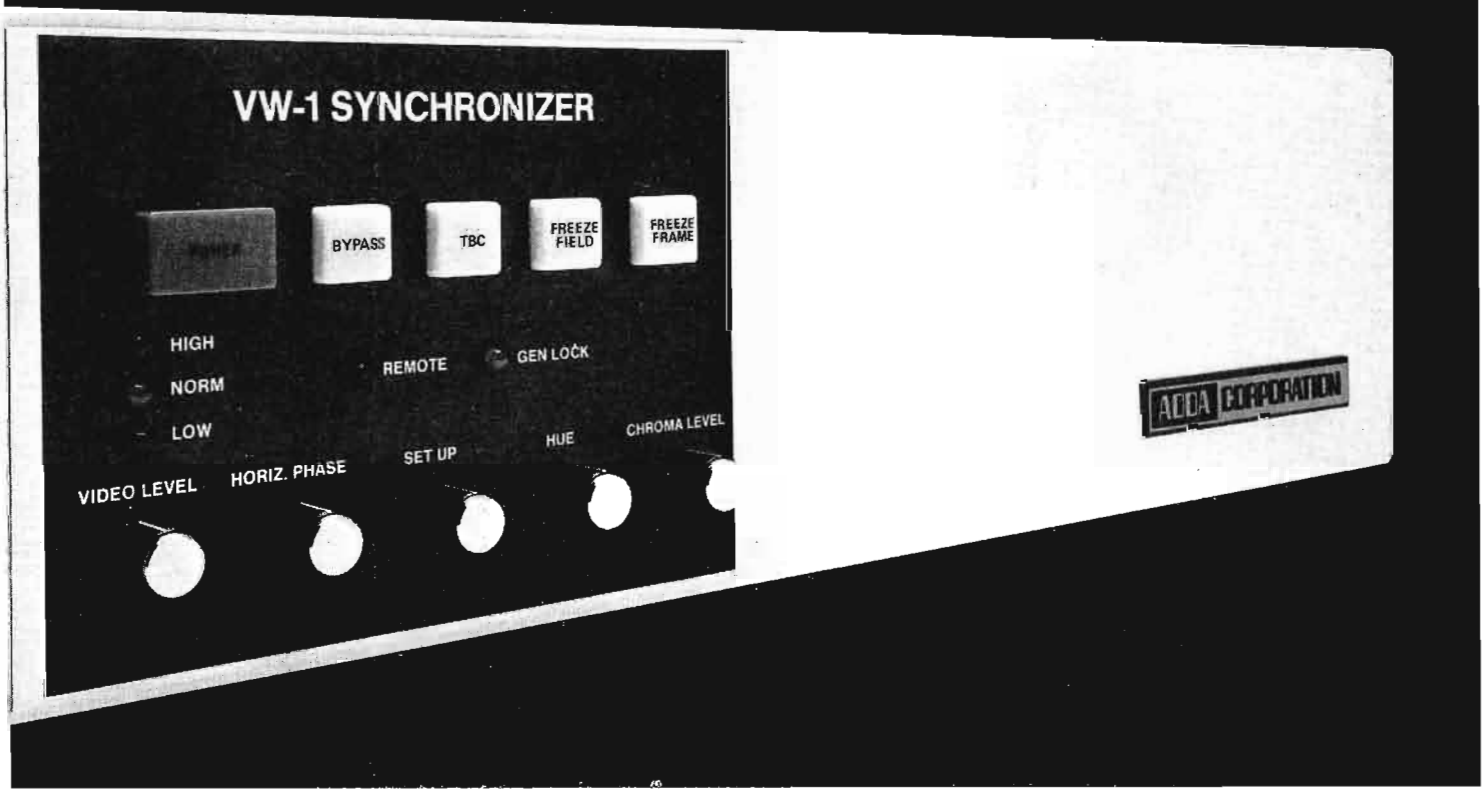

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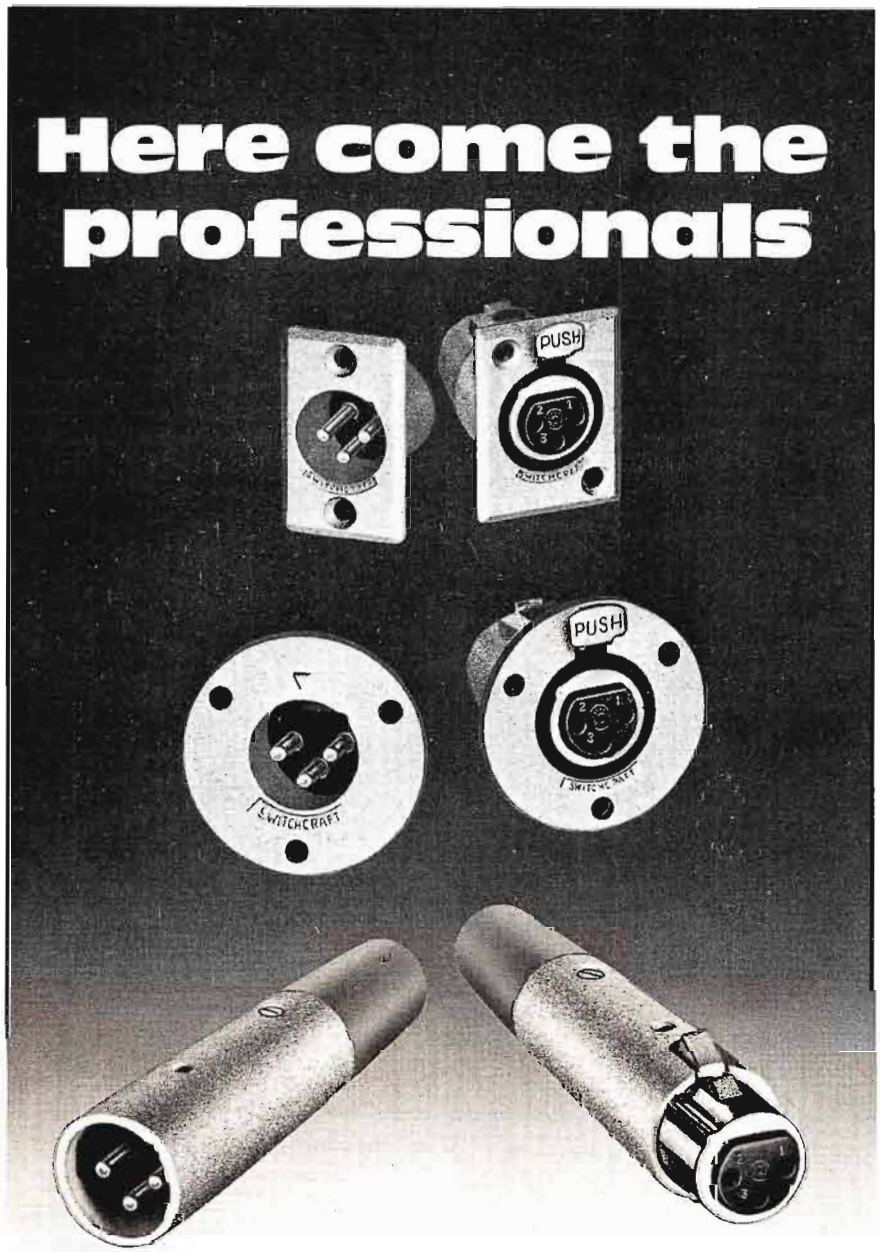

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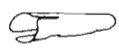

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Time code

continued from page 106

to that frame on channel two. The characters may be one frame behind the actual time code on channel two. This is because the character inserter does not have a one frame look-ahead circuit which puts the two in sync. Before making work prints, find out if the character inserter has been modified to correct this problem. Otherwise all the edits will be one frame late. The term for this modified unit is on-time, which indicates that it has the look-ahead feature.

• The video levels of the inserted characters are very important. Peak white levels should not exceed 80% and the black levels should not go below the blanking signal. Otherwise, the characters will distort and cause the picture to tear or roll vertically if they get into the synchronizing signals.

4. Check the video, audio and code levels periodically during recording to prevent distortion, low levels or any other problems.

5. Identify all tapes as clearly as possible. Be sure that all work print tapes carry the same identification as their corresponding master tapes. Most important are the show title, show number (if in a series), reel number, recorded date, whether master or ISO (isolated) feed, type of time code (DF or NDF), and any technical information about the tape.

6. After recording, rewind all tapes to their beginning. This is especially important for videocassettes to insure against transportation damage. Check the tape label against the box to be sure you are putting the right tape in the right box. Don't laugh! And similar problems occur every day.

7. Whenever possible, record a tape leader. Generally, this is from thirty to sixty seconds of color bars and reference tone at zero level on channel one.

8. Finally, and most important, when in doubt, ask. This simple rule will prevent errors, speed up production and keep costs (and tempers) down.

To sum it up, a little care in recording time code as well as in duplicating it, will prevent most edit abort errors and speed up post-production. It cannot be stressed often enough that "haste makes waste" and to re-do outweighs the time it takes to do it right the first time by a wide margin. Time code editing is here to stay. Let's try to make it easy. □

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Most popular TV channel frequencies

By Stu Rauch and Jens Simonsen

Manufacturers of television sets for closed-circuit TV distribution systems are faced with a common question: Which television channels should I choose for my distribution system? This important question normally arises whenever a new TV factory or a closed-circuit television system is planned.

There are many factors to consider in order to obtain the best reception at all locations and to avoid interference from local transmitters, or between the distributed channels. Some factors to be considered are:

- How many locally-generated signals must be transmitted?
- Are both VHF and UHF channels to be used?
- Are S-band channels wanted? (S-bands are the special CATV bands on either side of normal VHF television band III.)
- Must off-air channels be distributed?
- Should off-air channels be transferred to other channels in order to avoid influence from direct signal pick-up from strong TV transmitters?

As a general rule, the use of neighbor channels should be avoided because the adjacent channel suppression of TV receivers is often insufficient for good-quality reception. Also, local oscillator and image interference may occur, which means that channels placed at distances of the IF frequency, or twice that value, should be avoided.

For example, in the European TV system B(VHF), the channel separation is 7 MHz and the IF is usually about 39 MHz. The local oscillator frequency of a receiver tuned to channel "n" is situated in channel n+5, and the image is partly in channel n+10 and partly in n+11 (see Figure 1). In the U.S. system M, the channel separation is 6 MHz and the IF 45.75 MHz. Thus,

continued on page 112

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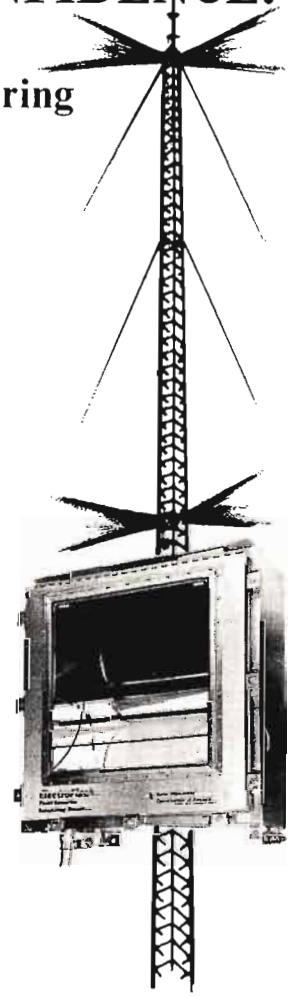

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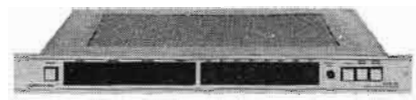

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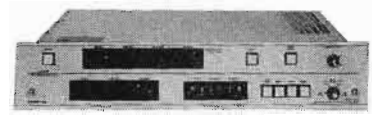

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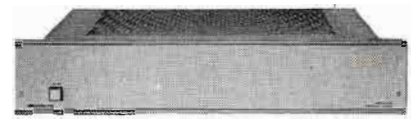

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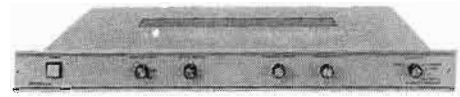

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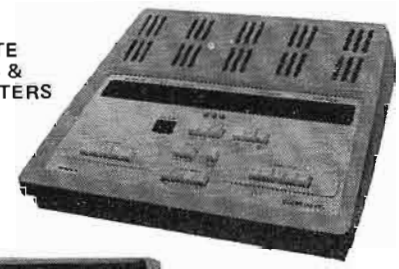

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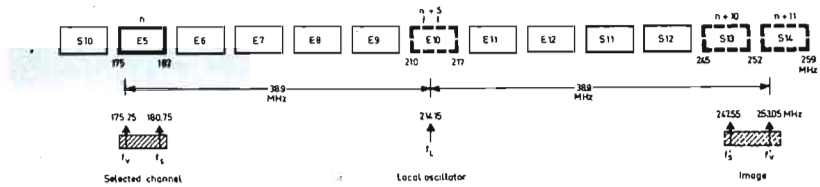

Figure 1 Origin of local oscillator and image interference. In this example, a TV receiver with 38.9 MHz IF is tuned to channel E5. The local oscillator can cause disturbance on E10. Interference from S13 and S14 may occur if image suppression is bad. Thus, channel E10, S13 and S14 should not be used with channel E5.

Figure 2 Professional TV modulator with UHF converter, Philips PM 5580 and PM 5594/5.

Channel frequencies

continued from page 110

troubles may occur in channels n+7, n+14 and n+15. In the European UHF systems, G, I and K, the separation is 8 MHz, and with the IF about 39 MHz the local oscillator will be located in the *holes* between the channels n+4 and n+5; in this case, we have only to consider the image at channel n+9.

U.S. vs European

When all of these points have been considered, there is still some freedom to select the channels, and the question arises as to whether some channels are more frequently chosen than others. The Philips development and supply center for professional TV equipment in Copenhagen has investigated this subject by reviewing about 2000 recent systems ordered by U.S. and European customers.

For some years Philips has supplied TV modulators and converters to manufacturers of television receivers, closed-circuit TV systems, and CATV systems. Figure 2 shows the Philips PM 5580 modulator and RF converter for the European system G. A typical television manufacturing plant central distribution

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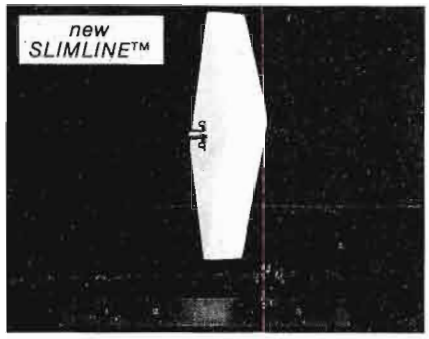

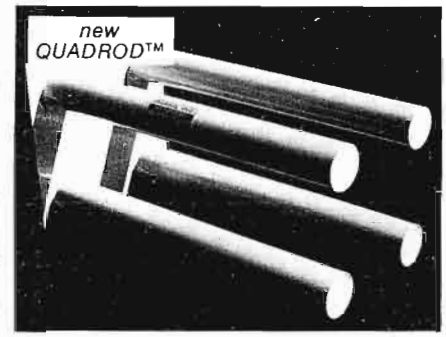

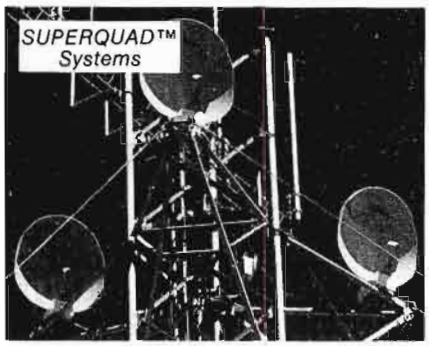

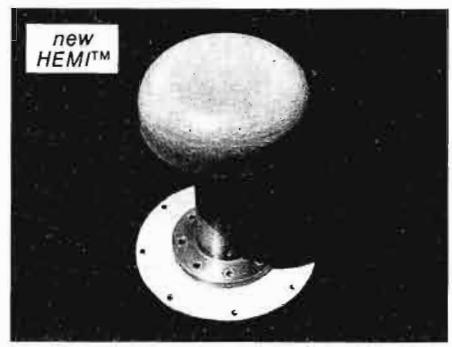

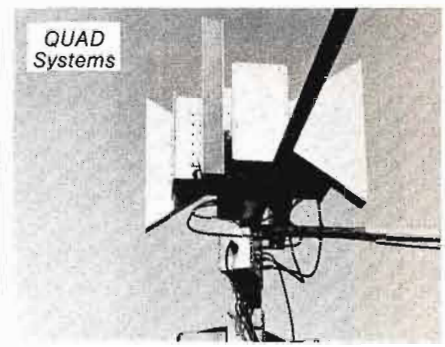

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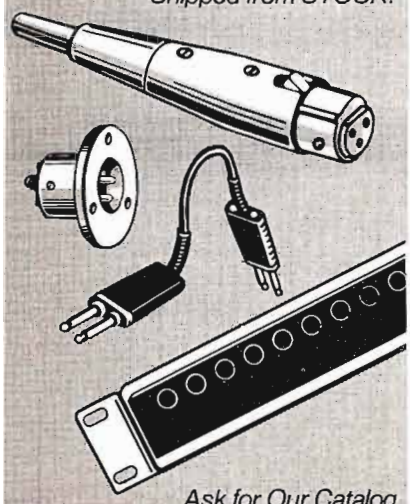
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Channel frequencies

continued from page 112

unit is shown in Figure 3. The Philips series of converters, PM 5591-5596, are crystal controlled and are supplied pretuned to the TV channel of the customer's choice.

The crystal frequency and channel designation of the 2000 Philips systems were used as input to a computerized analysis. The computer was programmed to identify the various TV systems, to perform a statistical anlysis, and to present the results in the form of several tables and histograms.

For the purposes of this article only the combined VHF and UHF histograms are illustrated. Figure 4 shows the American system M where channels 2 to 6 are situated in VHF band I, channels 7 to 13 in band III and channels 14 to 83 in the UHF bands IV and V.

Figure 5 shows the European VHF and UHF channels, and the histogram is combined from the TV systems B, G, H, I and K (channels

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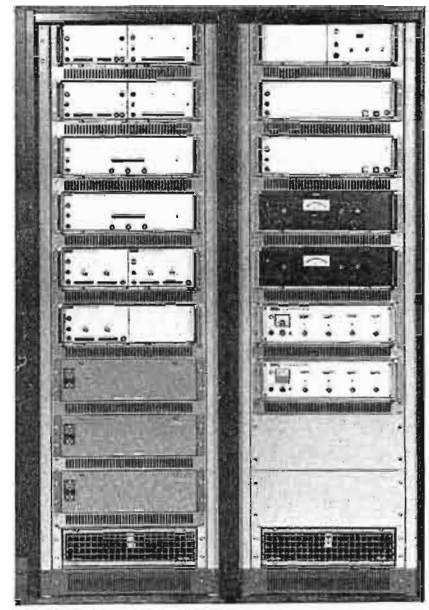
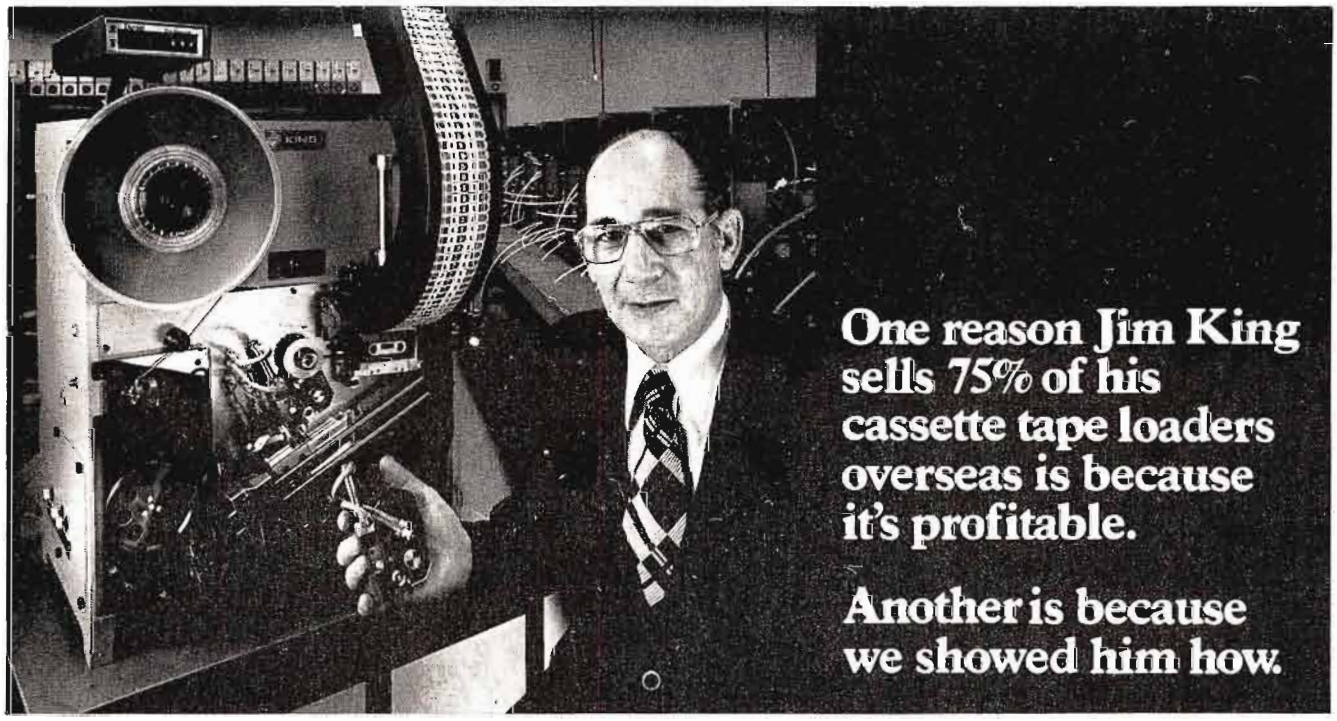


Figure 3 The central distribution unit of a manufacturing plant where two modulators and eight converters together with pattern generators and other progressional TV equipment are mounted in a 19-inch rack.



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You expect a quartz turntable to give unparalleled speed accuracy. And these do. What you didn't expect were all the other advantages Technics totally quartz-controlled direct-drive system gives you.

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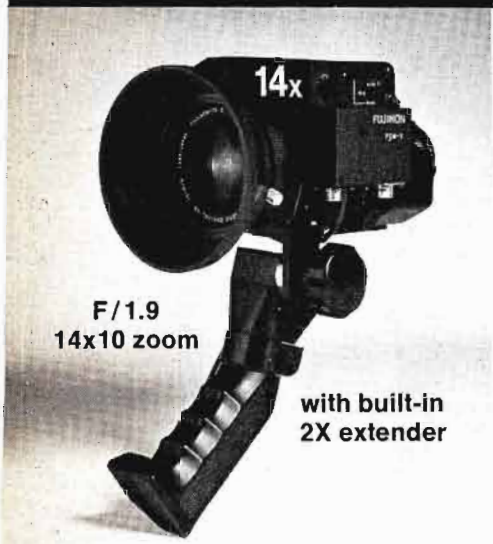

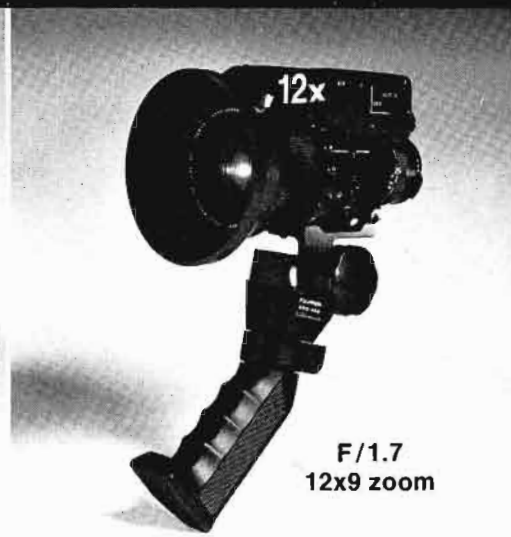

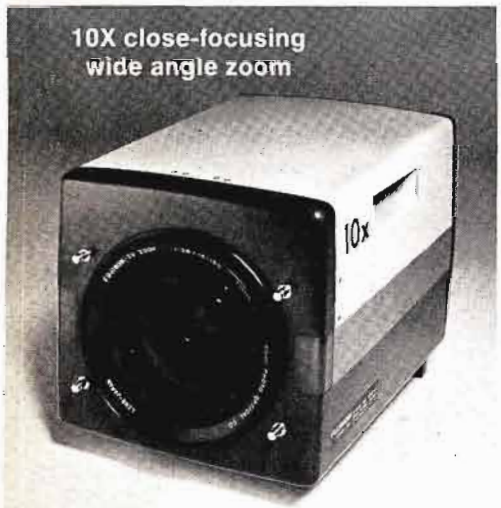

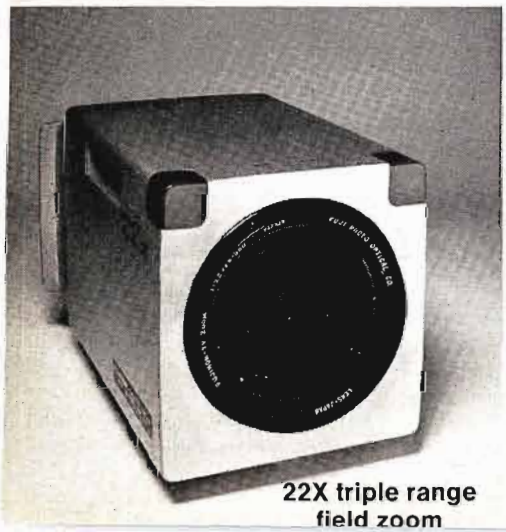

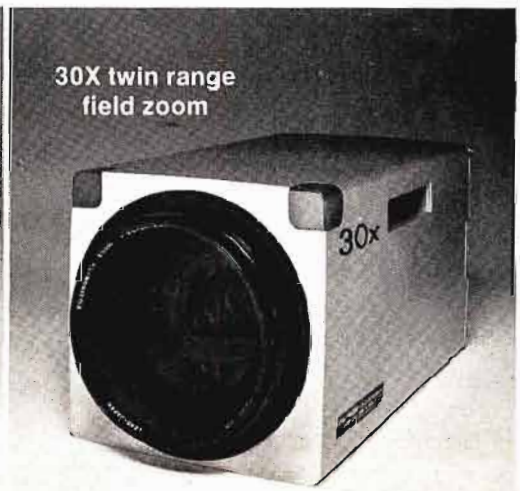

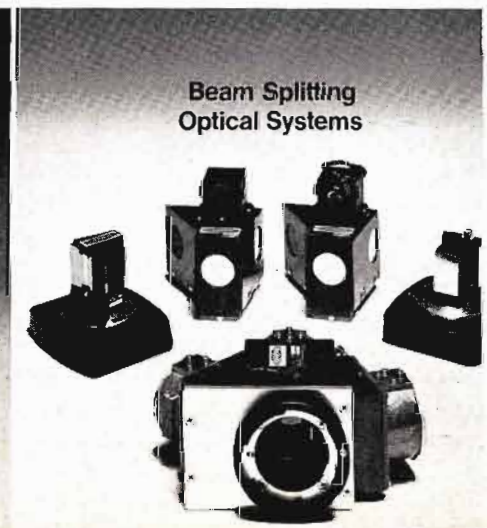

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what you see is always what you get.

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Besides being light years ahead in performance, value and quality, Fujinon backs you up with service that's the best available. Check the specs below on Fujinon BCTV lenses. Then ask for a free side-by-side demo. You'll soon agree that with Fujinon, what you see is always what you get. And if you don't see exactly what you want, just ask.

ENG/EFP Lenses (For Prism Type Cameras)

MODEL NO.	FORMAT	FOCAL LENGTH (mm)	f	M.O.O. (METERS)	DIAGONAL	FIELD ANGLE HORIZONTAL	VERTICAL	BACK FOCAL LENGTH (mm)	OPERATION MOUNT	IRIS	ZOOM	FOCUS	REMARKS
A10X10.5	⅔"	10.5X105	1.4	1.5	57°38'-6°18'	47°30'-5°04'	36°32'-3°47'	60.12		DC	Flexible Cable	Flexible Cable	Adaptable for 2X extender
A12X10	⅔"	10-120	1.9	0.8	57°37'-5°15'	47°30'-4°12'	36°32'-3°09'	58.08		DC	DC	Manual	
A12X19	⅔"	9-108	1.7	0.8	62°52'-5°50'	52°06'-4°40'	40°16'-3°30'	30.63		DC	DC	Manual	
A12X9	⅔"	10-140	1.9	0.8	57°37'-4°30'	47°30'-3°36'	36°32'-2°42'	38.99		DC	DC	Manual	Built-in 2X extender
A14X11	⅔"	11-154	2.1	0.8	53°08'-4°05'	43°36'-3°16'	33°24'-2°27'	60.36		DC	DC	Manual	Built-in 2X extender
A22X12.5	⅔"	12.5-275	1.6	2.5	47°9'-2°19'	38°30'-1°52'	29°21'-1°24'			DC	Manual	Manual	Built-in 2X extender
AF6	⅔"	6	1.4	0.2	83°54'	70°36'	56°00'			Manual		Manual	

ENG/EFP Lenses (For Relay Type Cameras)

N10X10	⅔"	10-100	1.9	1.0	57°37'-6°18'	47°30'-5°02'	36°32'-3°47'	29.02		DC	Manual	Manual	
N12X9	⅔"	9-108	1.7	0.8	62°52'-5°50'	52°06'-4°40'	40°16'-3°30'	29.30		DC	DC	Manual	
N14X10	⅔"	10-140	1.9	0.8	57°37'-4°30'	47°30'-3°36'	36°32'-2°42'	32.49		DC	DC	Manual	

Optical Accessories Systems for ENG/EFP Lenses

Servo Zoom Module (ZSM)	Grip Attachment (GHA)	DC Power Source (DPS)	Flexible Cable (CFC)
Servo Focus Module (FSM)	Extension Cable (ECA)	Mounting Clamp (MCA)	Zoom Handle (CZH)
Lens Grip (SRD)	Servo Focus Demand (FMM)	Manual Zoom Module (ZMM)	Manual Focus Demand (FMM)
			Focus Grip (CFH)

Studio/Field Television Lenses

R10X11	1"	11-110	2.1	0.35	72°00'-8°18'	60°12'-6°36'	47°06'-5°00'	60.52		DC	Flexible Cable	Flexible Cable	Adaptable for X1.5, 2, 2.5 extenders
R14X13	1"	13-182	1.6	0.75	63°00'-5°00'	52°30'-4°00'	40°30'-3°00'	61.53		DC	Flexible Cable	Flexible Cable	Adaptable for X1.5, 2, 2.5 extenders
R16X13	1"	13-210	1.6	0.75	63°13'-4°22'	52°25'-3°29'	40°32'-2°37'	61.70		DC	Manual or Servo Drive	Manual or Servo Drive	Built-in X1.5, 2, 2.5 extenders
R22X18	1"	18-400	1.8	2.5	46°27'-2°17'	37°54'-1°50'	28°53'-1°22'	60.84		DC	Flexible Cable	Flexible Cable	Built-in X1.5, 2 extenders
R30X16	1"	16-500	1.8	2.5	53°08'1°50'	43°36'-1°28'	33°24'-1°06'	70.03		DC	Manual or Servo Drive	Manual or Servo Drive	Built-in 2X extender
P10X15	1¼"	15-150	2.8	0.35	71°00'-8°00'	59°20'-6°30'	46°20'-4°54'	63.74		DC	Flexible Cable	Flexible Cable	Built-in 2X extender
P14X17	1¼"	17-240	2.2	0.75	63°00'-5°00'	52°30'-4°00'	40°30'-3°00'	88.37		DC	Flexible Cable	Flexible Cable	Adaptable for X1.5, 2, 2.5 extenders
P16X17	1¼"	17-270	2.1	0.75	64°22'-4°32'	53°27'-3°38'	41°23'-21°23'	61.72		DC	Manual or Servo Drive	Manual or Servo Drive	Built-in X1.5, 2, 2.5 extenders
P22X25	1¼"	25-550	2.2		46°19'-2°17'	37°46'-1°49'	28°47'-1°22'	95.98		DC	Flexible Cable	Flexible Cable	Built-in X1.5, 2.5 extenders
P30X20	1¼"	20-620	2.2	2.5	56°17'-1°59'	46°20'-1°35'	35°36'-1°11'	91.39		Servo Drive	Manual or Servo Drive	Manual or Servo Drive	Built-in 2X extender

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Surface parallelism: 0.05mm maximum thickness variation.
Tolerance of stripe width: For stripes less than 30 μm wide — less than 3 μm.
For stripes over 30 μm wide — less than ±10%
Tolerance of pitch width: Less than ±2 m.
Tolerance of total pitches: Less than 5 m to 100 pitches.

Image Format	1" Type	⅔" Type	The Others
Diameter	26.2 o ±0.1mm	17.6 o ±0.1mm	Variable
Thickness	2.5±0.3mm	1.5±0.2mm	Variable
Edge Bavel	0.25±0.13mm X 45°	0.2±0.1mm X 45°	Variable

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Channel frequencies

continued from page 114

2-4 in Band I, channels 5-12 in band III and 21-68 in bands IV and V).

From these histograms a "most popular" list can be made. For the American system, channel 2 is the most popular, followed by channels 6, 12 and 3. For the European systems, the score in decreasing order of popularity is channel 4, channel 21, channel 5 and channel 2.

It is interesting to observe that the low channel numbers are most frequently used and that the channel numbers at the beginning and end of each band dominate. Notice also that in the UHF range the round numbers (multiples of 10) are popular. This tendency may possibly have a psychological reason. Since there is more space in the UHF range, and if no restrictions due to local transmitter channels exist, there is a tendency for humans to select round figures.

The distribution between VHF and UHF channels is about 70/30 for the U.S. system compared with about equal distribution for European systems. However, it must be noted that since there was less data available for analysis for the American channels than for the European channels, this distribution pattern may not be completely accurate for the industry as a whole. □

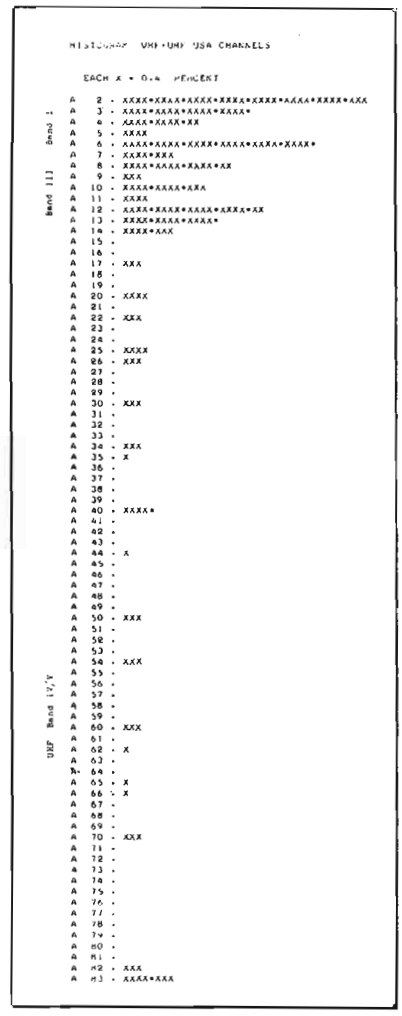

Figure 4 Histogram of VHF and UHF channels for American TV system M.

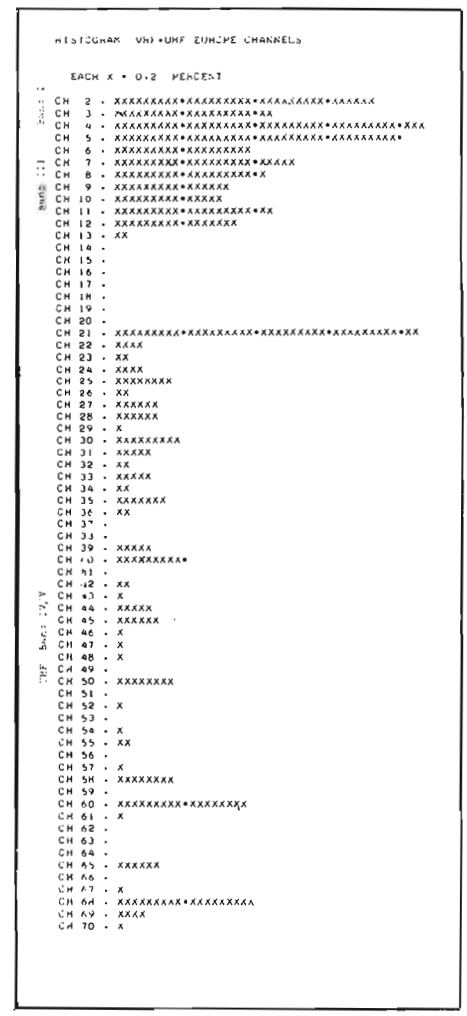

Figure 5 Histogram of VHF and UHF channels for European TV systems B, G, H, I and K.

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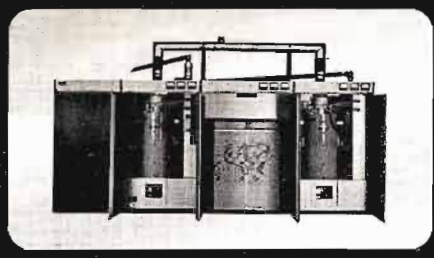
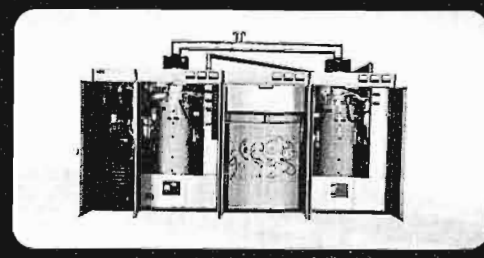
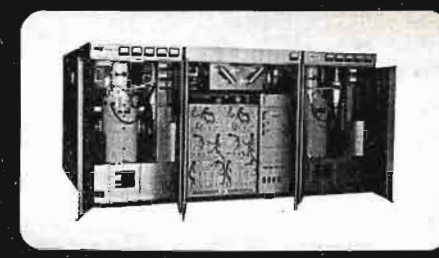
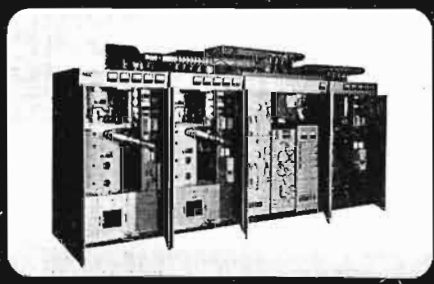
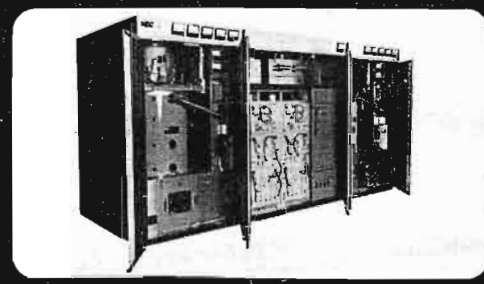
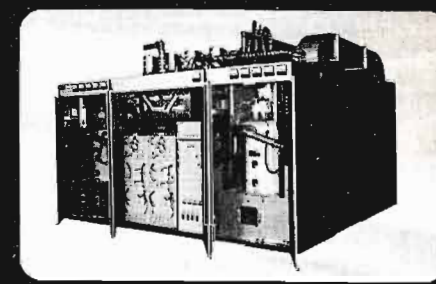
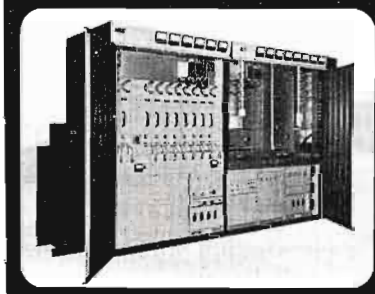

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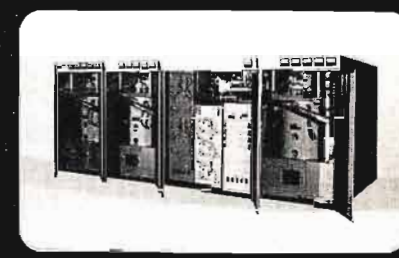
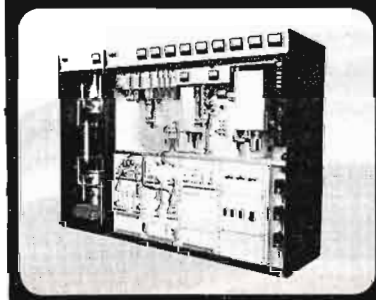
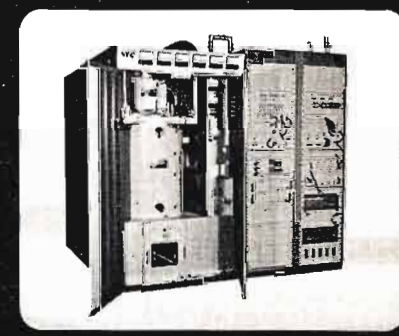

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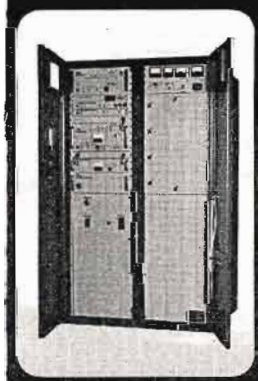
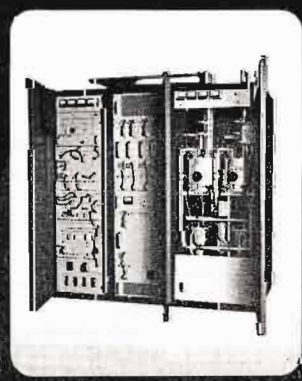
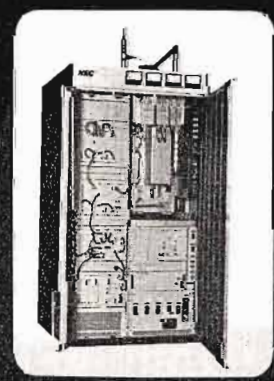

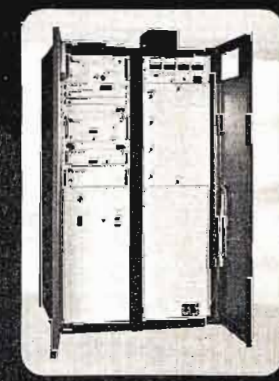
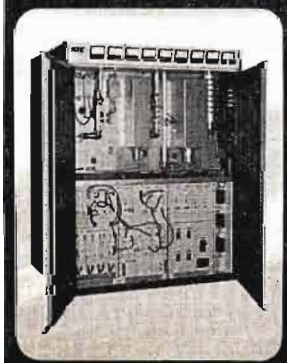
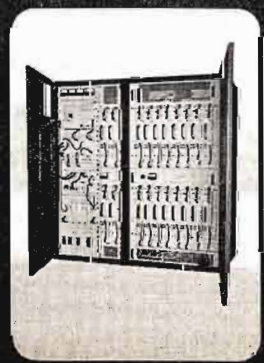
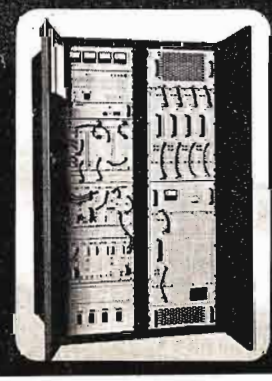
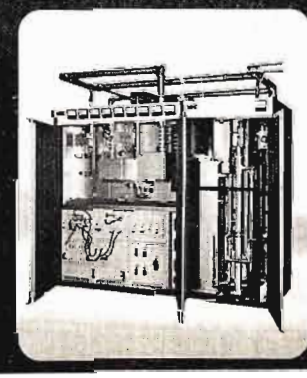
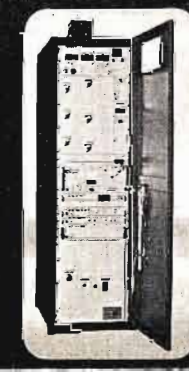

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AMPEX VR-1200

Computer Magnetics Corp. Sunnyvale, CA
AMPEX VR-1200

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Maritz Labs St. Louis, MO
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MGS Services New York, NY
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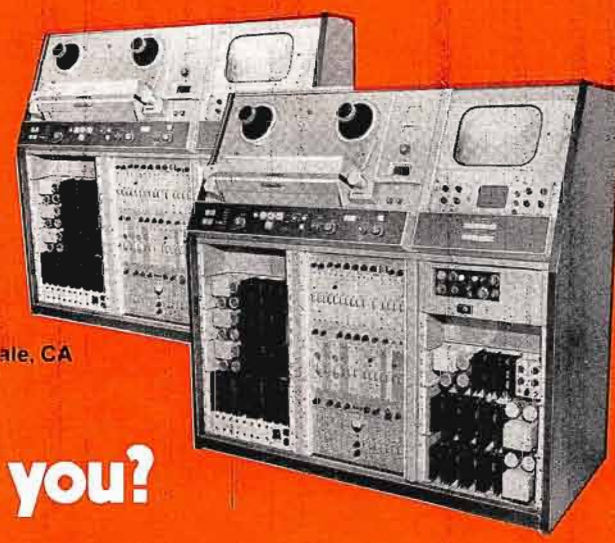

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1978 BROADCAST BUYERS' GUIDE

Since our first edition of the Buyers' Guide ten years ago, the broadcasting industry has grown tremendously in complexity of equipment and completeness of broadcast services. Just as the industry has responded to use of new technologies—most notably the microprocessor in all phases of automation—the Buyers' Guide has responded by providing the most complete directory possible for engineers, managers, and purchasing agents requiring broadcasting equipment and/or services. Reflecting the current healthy state of our industry, this year's Buyers' Guide has 818 product categories, lists 736 manufacturers, and contains 222 advertisers. It's the result of a dedicated staff effort to make it our finest tool for purchasing the industry's hardware, software, and services.

Companies with advertising in this issue are listed in red under each appropriate product heading. These Red Listings include the ad page location, to serve as a direct reference to the product information you are seeking.

Each year, Broadcast Engineering mails extensive questionnaire forms to suppliers around the world. They are asked to identify, by special code number, every product they currently market. In the process, scores of new products and companies are added, while lines that have been phased out—and firms that have left the field—are deleted. Once amassed and assembled, these new data are processed through a unique computer operation, programmed to "read" the code numbers and assigned company names and Red Listings to appropriate product headings.

Dealers or distributors are identified in the Product Directory by the letter "D" after the company name, followed by a numerical code showing the geographical regions (or portion of a region) served. The following chart shows the states included in each region:

1. New England (ME, NH, VT, MA, RI, CT)
2. Middle Atlantic (NY, NJ, PA)
3. East North Central (OH, IN, IL, MI, WI)
4. West North Central (MN, IA, MO, ND, KS, SD, NE)
5. South Atlantic (DE, MD, DC, VA, WV, NC, SC, GA, FL)
6. East South Central (KY, TN, AL, MS)
7. West South Central (AR, LA, OK, TX)
8. Mountain (MT, ID, WY, CO, NM, AZ, UT, NV)
9. Pacific (AK, WA, OR, CA, HI)

The Master Index of Manufacturers and Suppliers. Beginning on page 223 you'll find a complete, alphabetized index of mailing addresses for all of the companies listed in the Product Directory. Additional information appears under the index listing for advertisers in this issue: the name and telephone number of the home office sales manager, followed by, in many cases, a roster of regional sales contacts for that firm.

Reader Service Cards. For your convenience, multiple Reader Service Cards are bound into this edition. Each card is valid for a *full year*. By circling the appropriate numbers on the card, you can secure additional information, directly from the advertiser, through August 1979.

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3M Co. Mincom Div.
Vamco Engineering
Varian Associates, Inc. Electron Device Group
Video Aids Corp. of Colorado

Amplifiers, Video Sweep

KVC Video Systems Inc. D 1,2
Lenco Inc. Electronics Div.
Microwave Assoc. Inc.
Tektronix Inc.

Amplifiers, Zero Studio Delay

Grass Valley Group, Inc.
Lenco Inc. Electronics Div.
Microwave Assoc. Inc.
Sigma Electronics, Inc.
Sound Genesis D 8,9

Analysis Forms

Lauderdale Electronic Labs D 1-9

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Potomac Instruments, Inc. 206,207

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Autodyne D 1-9
Bald Mountain Lab
Cara Pacific Sales Co. D 8,9
Dyma Engineering, Inc.
H. M. Holzberg Associates, Inc. D 1,2,5
Inovonics
Leader Instruments Corp.
Potomac Instruments, Inc.
Sound Genesis D 8,9
Studio Electronics D 3,4,7
Track Audio, Inc. D 1-9

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Allied Broadcast Equipment D 1-9
Amber Electro Design, Ltd.
Autodyne D 1-9
B & K Instruments Inc.
Broadcast Electronics, Inc.
Cara Pacific Sales Co. D 8,9
Crown International, Inc.
Dyma Engineering, Inc.
Fisher Burke Professional Audio D 8
Frequency Devices Inc.
Harris Corp. Broadcast Products Div.
Heath Co.
H. M. Holzberg Associates, Inc. D 1,2,5
Ivie Electronics
Leader Instruments Corp.
The London Co.
Marconi Instruments Div. of Marconi Electronics Inc.
Potomac Instruments, Inc.
Rohde & Schwarz Sales Co.
Sound Technology
TM Systems, Inc.
Tektronix Inc.
Track Audio, Inc. D 1-9

Analyzers, Harmonic

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Sound Technology 25

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Allied Broadcast Equipment D 1-9
Amber Electro Design, Ltd.
B & K Instruments Inc.
Cara Pacific Sales Co. D 8,9
Fisher Burke Professional Audio D 8
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Ivie Electronics
Kay Elemetrics Corp.
Leader Instruments Corp.
Marconi Instruments Div. of Marconi Electronics Inc.
Potomac Instruments, Inc.
Rohde & Schwarz Sales Co.
Sound Technology
Tektronix Inc.
Track Audio, Inc. D 1-9

Analyzers, Insertion Signal

Cezar International, Ltd.
Marconi Instruments Div. of Marconi Electronics Inc.
Philips Test & Measuring Instruments, Inc.

Analyzers, Intermodulation

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Allied Broadcast Equipment D 1-9
Amber Electro Design, Ltd.
B & K Instruments Inc.
Cara Pacific Sales Co. D 8,9
Crown International, Inc.
Dyma Engineering, Inc.
Heath Co.
Marconi Instruments Div. of Marconi Electronics Inc.
Potomac Instruments, Inc.
Rohde & Schwarz Sales Co.
Sound Technology
Tektronix Inc.
Track Audio, Inc. D 1-9

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Dranetz Engineering Labs., Inc.

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Alford Mfg. Co.
Harris Corp. PRD Electronics Div.
Rohde & Schwarz Sales Co.
Scientific-Atlanta, Inc.
Tektronix Inc.
Wide Band Engineering Co., Inc.

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Kahn Communications, Inc.
Marconi Instruments Div. of Marconi Electronics Inc.
Rohde & Schwarz Sales Co.
Tektronix Inc.
Telemet a Geotel Co.

Analyzers, Spectrum

Altec Lansing Sound Products
Amber Electro Design, Ltd.
Audio Designs & Mfg.
B & K Instruments Inc.
Cara Pacific Sales Co. D 8,9
Harris Corp. Broadcast Products Div.
Ivie Electronics
Kahn Communications, Inc.
Kay Elemetrics Corp.
Marconi Instruments Div. of Marconi Electronics Inc.
Rohde & Schwarz Sales Co.
Sound Genesis D 8,9
Systron-Donner
Tektronix Inc.
Telemet a Geotel Co.
Texscan Corp.
Track Audio, Inc. D 1-9

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B & K Precision Dynascan Corp.
Colorado Video Inc.
Imero Fiorentino Associates, Inc.
Harris Corp. Broadcast Products Div.
Lenco Inc. Electronics Div.
Marconi Instruments Div. of Marconi Electronics Inc.
Rohde & Schwarz Sales Co.
Sencore Inc.
Tektronix Inc.
Telemet a Geotel Co.

Antenna Alignment Systems, Microwave

Advance Industries
Innovative Television Equipment, Inc.
Micro Communications, Inc. Grenier Field
Nurad, Inc.
Power-Optics Inc.
Scientific-Atlanta, Inc.
Texscan Corp.
Varian/Beverly Micro-Link Products

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Dyma Engineering, Inc.
G.C. Electronics
H. M. Holzberg Associates, Inc. D 1,2,5
Lita Broadcasting Distributors D 1-9
Fred A. Nudd Corp.
Philadelphia Resins Corp.
Singer Products Co., Inc.
Stainless, Inc.
Suda Seisakusho Co., Ltd. Nitsuko-Bldg.
Swager Tower Corp.
Tiner Communications Service, Inc. D
Unarco-Rohn Div. of Unarco Ind., Inc.
United Radio Supply Inc. D9

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Advance Industries
Broadcast Consultants Corp. D 1-9
CCA Electronics Corp.
Cetec Broadcast Group
Fisher Burke Professional Audio D 8
Fort Worth Tower Co., Inc.
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Micro Communications, Inc. Grenier Field

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Fred A. Nudd Corp.
Nurad, Inc.
Oldham Tower Systems
Prodelin Inc.
RCA Broadcast Systems
Soll
Stainless, Inc.
Suda Seisakusho Co., Ltd. Nitsuko-Bldg.
Swager Tower Corp.
Tiner Communications Service, Inc. D
Unarco-Rohn Div. of Unarco Ind., Inc.

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Dielectric Communications A Unit of General Signal
Electro Impulse, Inc.
H. M. Holzberg Associates, Inc. D 1,2,5
North Hills Electronics, Inc.
Phelps Dodge Communications Co.
Potomac Instruments, Inc.
Scala Radio Corp.

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Bird Electronic Corp.
Broadcast Consultants Corp. D 1-9
CCA Electronics Corp.
C. S. P. Inc.
Communication Modifications, Inc.
Continental Electronics Mfg. Co.
Corning Glass Works
Dielectric Communications A Unit of General Signal
Dyma Engineering, Inc.
Electro Impulse, Inc.
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Lectronic Research Laboratories, Inc. D 1-9
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
Maury Microwave Corp.
Micro Communications, Inc. Grenier Field
RCA Broadcast Systems
Rex Rheostat & Co., Inc.
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Antenna Heater Controls

Allied Broadcast Equipment D 1-9
CCA Electronics Corp.
Cetec Broadcast Group
H. M. Holzberg Associates, Inc. D 1,2,5
Lita Broadcasting Distributors D 1-9
Micro-Trak Corp.
Val-Tronics, Inc. D2

Antenna Ice Warning Systems

Allied Broadcast Equipment D 1-9
CCA Electronics Corp.
Cetec Broadcast Group
Harris Corp. Broadcast Products Div.
Micro-Trak Corp.
RCA Broadcast Systems
Val-Tronics, Inc. D2
The Widget Works, Inc.

Antenna Remote Indicators

CCA Electronics Corp.
Dielectric Communications A Unit of General Signal
Fisher Burke Professional Audio D 8
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Nurad, Inc.
Scientific-Atlanta, Inc.
Val-Tronics, Inc. D2

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CCA Electronics Corp.
C. S. P. Inc.
Delta Electronics Inc. (Va.)

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CCA Electronics Corp.
C. S. P. Inc.
Cablewave Systems Inc.
Cetec Broadcast Group
Delta Electronics Inc. (Va.)
Elcom Engineering Co.
Geleco Electronics Ltd.
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Moseley Associates, Inc.
Multronics, Inc.
North American Radio Corp.

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Andrew Corp.
Anixter-Mark
Bogner Broadcast Equipment Corp.
CCA Electronics Corp.
C. S. P. Inc.
Cablewave Systems Inc.
Cetec Broadcast Group
Continental Electronics Mfg. Co.
Delta Electronics Inc. (Va.)
Dielectric Communications A Unit of General Signal
Dyma Engineering, Inc.
The Finney Co.
G.C. Electronics
Geleco Electronics Ltd.
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
KVC Video Systems Inc. D 1,2
Marconi Communication Systems Ltd.
Mastertone Co., Inc. D 4
Micro Communications, Inc. Grenier Field
Micro Control Associates, Inc.
Microwave Assoc. Inc.
Multronics, Inc.
Nurad, Inc.
Phelps Dodge Communications Co.
Prodelin Inc.
RCA Broadcast Systems
RF Systems, Inc.
Rohde & Schwarz Sales Co.
Scala Radio Corp.
Shively Laboratories, Inc.
Singer Products Co., Inc.
Sitco Antenna Co.
Tayburn Electronics, Inc.
Winegard Television Systems

Antenna Tuning Units

CCA Electronics Corp.
CSI Electronics, Inc.
C. S. P. Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Continental Electronics Mfg. Co.
Dielectric Communications A Unit of General Signal
Dyma Engineering, Inc.
G.C. Electronics
Geleco Electronics Ltd.
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Maury Microwave Corp.
Micro Communications, Inc. Grenier Field
Multronics, Inc.
North American Radio Corp.
RCA Broadcast Systems
Texscan Corp.
Tri-Tronics Professional Electronics
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

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Bird Electronic Corp.
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Communication Modifications, Inc.
Dielectric Communications A Unit of General Signal
Dyma Engineering, Inc.
Harris Corp. Broadcast Products Div.
Leader Instruments Corp.
Micro Communications, Inc. Grenier Field
Moseley Associates, Inc.
Sencore Inc.
Singer Products Co., Inc.
Texscan Corp.

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Bogner Broadcast Equipment Corp.
Broadcast Consultants Corp. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
C. S. P. Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Continental Electronics Mfg. Co.
Dielectric Communications A Unit of General Signal
The Finney Co.
Geleco Electronics Ltd.
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Innovative Television Equipment, Inc.
Micro Communications, Inc. Grenier Field
Multronics, Inc.
Nurad, Inc.
RCA Broadcast Systems
RF Systems, Inc.
Rohde & Schwarz Sales Co.
Scala Radio Corp.
Shively Laboratories, Inc.
Singer Products Co., Inc.

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Catel Div. United Scientific Corp.
Communications, Ltd.
The Finney Co.
G.C. Electronics
Harris Corp. Broadcast Products Div.
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Johnson Electronics Inc.
McMartin Industries, Inc.
Micro Communications, Inc. Grenier Field
RF Systems, Inc.
Rohde & Schwarz Sales Co.
Scala Radio Corp.
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KVC Video Systems Inc. D 1,2
McKay Dymek Co.
Rohde & Schwarz Sales Co.

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Blonder-Tongue Labs.
EMCEE Broadcast Products
The Finney Co.
G.C. Electronics
Heath Co.
H. M. Holzberg Associates, Inc. D 1,2,5
Micro Communications, Inc. Grenier Field
Nurad, Inc.
Peirce-Phelps, Inc. Video Systems Div. D 2,5
Phelps Dodge Communications Co.
Prodelin Inc.
RCA Distributor & Special Products Div.
RF Systems, Inc.
Rohde & Schwarz Sales Co.
Scala Radio Corp.
Scientific-Atlanta, Inc.
Singer Products Co., Inc.
Sitco Antenna Co.
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Winegard Television Systems

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Communications, Ltd.
EMCEE Broadcast Products
The Finney Co.
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Heath Co.
H. M. Holzberg Associates, Inc. D 1,2,5
Micro Communications, Inc. Grenier Field
Nurad, Inc.
Peirce-Phelps, Inc. Video Systems Div. D 2,5
Phelps Dodge Communications Co.
Prodelin Inc.
RCA Distributor & Special Products Div.
RF Systems, Inc.
Rohde & Schwarz Sales Co.
Scala Radio Corp.
Scientific-Atlanta, Inc.
Sitco Antenna Co.
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Engineering Associates
Farinon Electric
H. M. Holzberg Associates, Inc. D 1,2,5
Lectronic Research Laboratories, Inc. D 1-9
Mastertone Co., Inc. D 4
Maury Microwave Corp.
Micro Communications, Inc. Grenier Field
Microwave Assoc. Inc.
Nurad, Inc.
Prodelin Inc.
RF Systems, Inc.
Rohde & Schwarz Sales Co.
Scientific-Atlanta, Inc.
Singer Products Co., Inc.
Tayburn Electronics, Inc.
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Andrew Corp.
Anixter-Mark
Belar Electronics Lab., Inc.
Broadcast Consultants Corp. D 1-9
CCA Electronics Corp.
Cetec Broadcast Group
Dyma Engineering, Inc.
Farinon Electric
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
Micro Communications, Inc. Grenier Field
Moseley Associates, Inc.
Nurad, Inc.
Scala Radio Corp.
Scientific-Atlanta, Inc.
Tayburn Electronics, Inc.
Wilkinson Electronics, Inc.

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Broadcast Component Dist. Communication Medias 200

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Broadcast Component Dist. Communication Medias D 1-9
Broadcast Consultants Corp. D 1-9
CCA Electronics Corp.
Cetec Broadcast Group
Dielectric Communications A Unit of General Signal
Dyma Engineering, Inc.
Farinon Electric
H. M. Holzberg Associates, Inc. D 1,2,5
Winegard Television Systems

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Allied Broadcast Equipment D 1-9
Andrew Corp.
Anixter-Mark
Broadcast Consultants Corp. D 1-9
CCA Electronics Corp.
Cablewave Systems Inc.
Cetec Broadcast Group
Contel Mfg.
Dielectric Communications A Unit of General Signal
Dyma Engineering, Inc.
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
Micro Communications, Inc. Grenier Field
Micro Control Associates, Inc.
Moseley Associates, Inc.
Nurad, Inc.
Prodelin Inc.
RCA Broadcast Systems
Scala Radio Corp.
Singer Products Co., Inc.
Swager Tower Corp.
TerraCom
Val-Tronics, Inc. D2
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Cetec Broadcast Group
Collins Div. Rockwell International
Dielectric Communications A Unit of General Signal
Dyma Engineering, Inc.
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
LPB Inc.
Marconi Communication Systems Ltd.
Mastertone Co., Inc. D 4
Maze Corp D6
McMartin Industries, Inc.
Micro Communications, Inc. Grenier Field
Phelps Dodge Communications Co.
RCA Broadcast Systems
Rohde & Schwarz Sales Co.
Scala Radio Corp.
Shively Laboratories, Inc.
Singer Products Co., Inc.
Sound Dynamics, Inc. D8, 9
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

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Cetec Broadcast Group
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Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Micro Communications, Inc. Grenier Field
Stainless, Inc.

Antennas, Transmitting MF

CCA Electronics Corp.
Cetec Broadcast Group
Continental Electronics Mfg. Co.
Dielectric Communications A Unit of General Signal
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
McMartin Industries, Inc.
Rohde & Schwarz Sales Co.
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Anixter-Mark
Bogner Broadcast Equipment Corp.
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Dielectric Communications A Unit of General Signal
Dyma Engineering, Inc.
EMCEE Broadcast Products
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
Micro Communications, Inc. Grenier Field
Nurad, Inc.
Phelps Dodge Communications Co.
Prodelin Inc.
RCA Broadcast Systems
Rohde & Schwarz Sales Co.
SWR Inc.
Scala Radio Corp.
Shively Laboratories, Inc.
Sitco Antenna Co.

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Alford Mfg. Co.
Bogner Broadcast Equipment Corp.
CCA Electronics Corp.
Cetec Broadcast Group
Dielectric Communications A Unit of General Signal
Dyma Engineering, Inc.
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Nurad, Inc.
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Bogner Broadcast Equipment Corp.
CCA Electronics Corp.
Cetec Broadcast Group
Dielectric Communications A Unit of General Signal
Dyma Engineering, Inc.
EMCEE Broadcast Products
The Finney Co.
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
Micro Communications, Inc. Grenier Field
Nurad, Inc.
Phelps Dodge Communications Co.
Prodelin Inc.
RCA Broadcast Systems
Rohde & Schwarz Sales Co.
SWR Inc.
Scala Radio Corp.
Shively Laboratories, Inc.
Singer Products Co., Inc.
Sitco Antenna Co.

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Alford Mfg. Co.
Andrew Corp.
Anixter-Mark
Bogner Broadcast Equipment Corp.
CCA Electronics Corp.
Cablewave Systems Inc.
Dyma Engineering, Inc.
Farinon Electric
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Mastertone Co., Inc. D 4
Micro Communications, Inc. Grenier Field
Micro Control Associates, Inc.
Microwave Assoc. Inc.
Nurad, Inc.
Prodelin Inc.
RF Systems, Inc.
Rohde & Schwarz Sales Co.
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Tayburn Electronics, Inc.
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Collins Div. Rockwell International
Farinon Electric
Harris Corp. Broadcast Products Div.
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Hughes Aircraft Co. Microwave Communications Products
Marconi Communication Systems Ltd.
Microdyne Corp.
Nurad, Inc.
Prodelin Inc.
RF Systems, Inc.
Scientific-Atlanta, Inc.
TerraCom

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Broadcast Communications Devices, Inc. D 8,9
Broadcast Component Dist. Communication Medias D 1-9
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Broadcast Electronics, Inc.
Broadcast Equipment Distributors D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
Cetec Broadcast Group
Dyma Engineering, Inc.
EMT Franz VGmbH
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
LPB Inc.
Mastertone Co., Inc. D 4
McCurdy Radio Ind. Inc.
Micro-Trak Corp.
Oregon Sound & Lights D 8,9
Osawa & Co. (USA), Inc.
Peirce-Phelps, Inc. Video Systems Div. D 2,5
Professional Audio Service D 1-9

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QRK Electronic Products
Russco Electronics Mfg. Inc.
Shure Brothers Inc.
Singer Products Co., Inc.
Sound Dynamics, Inc. D8, 9
Sound Genesis D 8,9
Stanton Magnetics Inc.
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Westlake Audio
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Audio Designs & Mfg.
Audio Distributor Inc. D 3, 4, 6, 7
Automated Processes, Inc.
Bayly Engineering Ltd.
CCA Electronics Corp.
Cetec Broadcast Group
Duncan Electronics, Inc.
Gotham Audio Corp.
Harris Corp. Broadcast Products Div.
Kay Elemetrics Corp.
Kings Electronics Co., Inc.
Lauderdale Electronic Labs D 1-9
Marconi Instruments Div. of Marconi Electronics Inc.
Orange County Electronics Int'l., Inc.
Potomac Instruments, Inc.
Quad-Eight Electronics
ROH Corporation
Richmond Sound Design, Ltd.
Robins Broadcast & Sound Equip. Corp.
Rohde & Schwarz Sales Co.
Shallco, Inc.
Shure Brothers Inc.
Sound Genesis D 8,9
Spectra Sonics
Tech Laboratories Inc.
Texscan Corp.
Waters Mfg. Inc.
Weinschel Engineering Co.
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Bayly Engineering Ltd.
Bird Electronic Corp.
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Dielectric Communications A Unit of General Signal
Electro Impulse, Inc.
The Finney Co.
Harris Corp. Broadcast Products Div.
Harris Corp. PRD Electronics Div.
Holland Electronics
Kay Elemetrics Corp.
Kings Electronics Co., Inc.
Lauderdale Electronic Labs D 1-9
Lectronic Research Laboratories, Inc. D 1-9
Maury Microwave Corp.
Merill Cable Equipment Corp.
Mu-Del Electronics, Inc.
The Narda Microwave Corporation
Orange County Electronics Int'l., Inc.
Rohde & Schwarz Sales Co.
Shallco, Inc.
Tech Laboratories Inc.
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Trompeter Electronics
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Cetec Broadcast Group
Dielectric Communications A Unit of General Signal
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Kay Elemetrics Corp.
Lauderdale Electronic Labs D 1-9
Maury Microwave Corp.
Merill Cable Equipment Corp.
Mu-Del Electronics, Inc.
The Narda Microwave Corporation
North Hills Electronics, Inc.
Rohde & Schwarz Sales Co.
Shallco, Inc.
Sound Genesis D 8,9
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Texscan Corp.
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Harris Corp. PRD Electronics Div.
Kay Elemetrics Corp.
Kings Electronics Co., Inc.
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Microwave Assoc. Inc.
Mu-Del Electronics, Inc.
Multronics, Inc.
North American Radio Corp.
North Hills Electronics, Inc.
Phelps Dodge Communications Co.
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Tektronix Inc.
Telcom Research
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Microwave Assoc. Inc.
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Mu-Del Electronics, Inc.
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North American Radio Corp.
North Hills Electronics, Inc.
Phelps Dodge Communications Co.
Scala Radio Corp.
Shively Laboratories, Inc.
Tektronix Inc.
Trompeter Electronics
Weinschel Engineering Co.
Wide Band Engineering Co., Inc.

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AILTECH Div. Cutler-Hammer Los Angeles Operation
John Fluke Mfg. Co., Inc.
ITT Jennings
North Hills Electronics, Inc.
Tech Laboratories Inc.

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Varian Associates, Inc. Electron Device Group
Varian/Beverly Micro-Link Products

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Bayly Engineering Ltd.
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Film Inspection and Cleaning Equipment

Houston Photo Products, Inc.
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North American Radio Corp.
Nurad, Inc.
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Comark Industries Inc.
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Rank Precision Industries, Inc. (N.Y.)
Schneider Corp. of America
Jos. Schneider GmbH & Co. P.O. Box 947
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Dyma Engineering, Inc.
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Lightning Elimination Assoc., Inc.
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EIP Microwave
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Engineering Associates
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Harris Corp. PRD Electronics Div.
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Philips Test & Measuring Instruments, Inc.
Pulse Dynamics Mfg. Corp. (PDMC)
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Eric Small & Associates
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Multronics, Inc.
North American Radio Corp.
North Hills Electronics, Inc.
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Ram Audio Systems, Inc.
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Pulse Dynamics Mfg. Corp. (PDMC)
Richmond Sound Design, Ltd.
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Neumade Products Corp.
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Channelmatic, Inc.
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TM Systems, Inc.
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Bald Mountain Lab
Bayly Engineering Ltd.
Channelmatic, Inc.
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H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
Singer Products Co., Inc.
Sintronic Corp.
Wilkinson Electronics, Inc.

Transmitters, AM 1 kw

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Sintronic Corp. 105
Wilkinson Electronics, Inc. 194

Allied Broadcast Equipment D 1-9
Broadcast Consultants Corp. D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Contel Mfg.
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
RCA Broadcast Systems
Singer Products Co., Inc.
Sintronic Corp.
Sound Dynamics, Inc. D8, 9
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, AM 2 kw

CCA Electronics Corp.
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Tele-Measurements, Inc. D 2

Transmitters, AM 2.5 kw

Allied Broadcast Equipment D 1-9
Broadcast Consultants Corp. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International

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Dyma Engineering, Inc.
Fisher Burke Professional Audio D 8
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
McMartin Industries, Inc.
Sound Dynamics, Inc. D8, 9
Tele-Measurements, Inc. D 2
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, AM 3 kw

Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
McMartin Industries, Inc.
RCA Broadcast Systems
Singer Products Co., Inc.
Wilkinson Electronics, Inc.

Transmitters, AM 5 kw

See Adv. Page

Broadcast Component Dist. Communication Medias....200
Collins Div. 31
Continental Electronics Mfg. Co. 247
Sintronic Corp.....105
Wilkinson Electronics, Inc.....194

AEL, Inc.
Allied Broadcast Equipment D 1-9
Broadcast Component Dist.
Communication Medias D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Contel Mfg.
Continental Electronics Mfg. Co.
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
RCA Broadcast Systems
Singer Products Co., Inc.
Sintronic Corp.
Sound Dynamics, Inc. D8, 9
Temtron Electronics D 1-9
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, AM 10 kw

See Adv. Page

Broadcast Component Dist. Communication Medias....200
Continental Electronics Mfg. Co. 247
Sintronic Corp.....105
Wilkinson Electronics, Inc.....194

AEL, Inc.
Broadcast Component Dist.
Communication Medias D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Contel Mfg.
Continental Electronics Mfg. Co.
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
RCA Broadcast Systems
Singer Products Co., Inc.
Sintronic Corp.
Sound Dynamics, Inc. D8, 9
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, AM 15 kw

Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Singer Products Co., Inc.
Wilkinson Electronics, Inc.

Transmitters, AM 20 kw

See Adv. Page

Wilkinson Electronics, Inc.....194

CCA Electronics Corp.
Collins Div. Rockwell International
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
McMartin Industries, Inc.
Sound Dynamics, Inc. D8, 9
Wilkinson Electronics, Inc.

Transmitters, AM 25 kw

Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Contel Mfg.
Continental Electronics Mfg. Co.
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Singer Products Co., Inc.
Wilkinson Electronics, Inc.

Transmitters, AM 50 kw

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Broadcast Component Dist. Communication Medias....200
Sintronic Corp.....105
Wilkinson Electronics, Inc.....194

AEL, Inc.
Bayly Engineering Ltd.
Broadcast Component Dist.
Communication Medias D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Collins Div. Rockwell International
Continental Electronics Mfg. Co.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
North American Radio Corp.
RCA Broadcast Systems
Singer Products Co., Inc.
Sintronic Corp.
Sound Dynamics, Inc. D8, 9
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, AM over 50 kw

AEL, Inc.
Bayly Engineering Ltd.
CCA Electronics Corp.
CSI Electronics, Inc.
Continental Electronics Mfg. Co.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
North American Radio Corp.
Singer Products Co., Inc.

Transmitters, AM to order

See Adv. Page

CCA Electronics Corp. 221
Cetec Broadcast Group 118
Collins Div. 31
Continental Electronics Mfg. Co. 247
Harris Corp. 17
Sintronic Corp.....105
Val-Tronics, Inc.....245

CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Continental Electronics Mfg. Co.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Maze Corp D6
McMartin Industries, Inc.
North American Radio Corp.
Singer Products Co., Inc.
Sintronic Corp.
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, FM 10 Watt

See Adv. Page

Broadcast Component Dist. Communication Medias....200
Sintronic Corp.....105
Wilkinson Electronics, Inc.....194

AEL, Inc.
Allied Broadcast Equipment D 1-9
Bayly Engineering Ltd.
Broadcast Component Dist.
Communication Medias D 1-9
Broadcast Consultants Corp. D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Dyma Engineering, Inc.
GTE Lenkurt, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
LPB Inc.
Marconi Communication Systems Ltd.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
QEI Corp.
RCA Broadcast Systems
Rohde & Schwarz Sales Co.
Singer Products Co., Inc.
Sintronic Corp.
Sound Dynamics, Inc. D8, 9
Val-Tronics, Inc. D2
Versa Count Engineering
Wilkinson Electronics, Inc.

Transmitters, FM 40 Watt

Bayly Engineering Ltd.
CCA Electronics Corp.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Val-Tronics, Inc. D2

Transmitters, FM 50 Watt

AEL, Inc.
Allied Broadcast Equipment D 1-9
Bayly Engineering Ltd.
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
Rohde & Schwarz Sales Co.
Singer Products Co., Inc.
Versa Count Engineering
Wilkinson Electronics, Inc.

Transmitters, FM 100 Watt

See Adv. Page

NEC America, Inc.....119
Wilkinson Electronics, Inc.....194

AEL, Inc.
Allied Broadcast Equipment D 1-9
Bayly Engineering Ltd.
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Marti Electronics
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
NEC America, Inc. Broadcasting Equip. Div.
Scientific Radio Systems, Inc.
Singer Products Co., Inc.
Versa Count Engineering
Wilkinson Electronics, Inc.

Transmitters, FM 250 Watt

See Adv. Page

NEC America, Inc.....119
Wilkinson Electronics, Inc.....194

AEL, Inc.
Bayly Engineering Ltd.
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Marti Electronics
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
NEC America, Inc. Broadcasting Equip. Div.
North American Radio Corp.
Singer Products Co., Inc.
Versa Count Engineering
Wilkinson Electronics, Inc.

Transmitters, FM 500 Watt

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NEC America, Inc.....119
Wilkinson Electronics, Inc. 39,194

Bayly Engineering Ltd.

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Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
NEC America, Inc. Broadcasting Equip. Div.
RCA Broadcast Systems
Singer Products Co., Inc.
Wilkinson Electronics, Inc.

Transmitters, FM 1 kw

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NEC America, Inc.....119
Wilkinson Electronics, Inc.....39,194

AEL, Inc.
Allied Broadcast Equipment D 1-9
Bayly Engineering Ltd.
Broadcast Consultants Corp. D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
NEC America, Inc. Broadcasting Equip. Div.
North American Radio Corp.
RCA Broadcast Systems
Scientific Radio Systems, Inc.
Singer Products Co., Inc.
Sintronic Corp.
Sound Dynamics, Inc. D8, 9
Tele-Measurements, Inc. D 2
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, FM 1.5 kw

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Sintronic Corp.....105
Wilkinson Electronics, Inc.....194

Allied Broadcast Equipment D 1-9
Bayly Engineering Ltd.
CCA Electronics Corp.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Singer Products Co., Inc.
Sintronic Corp.
Wilkinson Electronics, Inc.

Transmitters, FM 2 kw

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Wilkinson Electronics, Inc.....39,194

Bayly Engineering Ltd.
CCA Electronics Corp.
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
McMartin Industries, Inc.
Wilkinson Electronics, Inc.

Transmitters, FM 2.5 kw

See Adv. Page

Broadcast Component Dist. Communication Medias.....200

AEL, Inc.
Allied Broadcast Equipment D 1-9
Bayly Engineering Ltd.
Broadcast Component Dist. Communication Medias D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
North American Radio Corp.
Singer Products Co., Inc.
Tele-Measurements, Inc. D 2
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, FM 3 kw

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NEC America, Inc.....119

AEL, Inc.
Allied Broadcast Equipment D 1-9
Bayly Engineering Ltd.
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Fisher Burke Professional Audio D 8
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
NEC America, Inc. Broadcasting Equip. Div.
RCA Broadcast Systems
Singer Products Co., Inc.
Sintronic Corp.
Sound Dynamics, Inc. D8, 9
Val-Tronics, Inc. D2

Transmitters, FM 3.5 kw

See Adv. Page

Sintronic Corp.....105

Allied Broadcast Equipment D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
McMartin Industries, Inc.
Singer Products Co., Inc.
Sintronic Corp.

Transmitters, FM 4 kw

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Wilkinson Electronics, Inc.....194

CCA Electronics Corp.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
Wilkinson Electronics, Inc.

Transmitters, FM 5 kw

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NEC America, Inc.....119
Sintronic Corp.....105
Wilkinson Electronics, Inc.....194

AEL, Inc.
Allied Broadcast Equipment D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
NEC America, Inc. Broadcasting Equip. Div.
RCA Broadcast Systems
Singer Products Co., Inc.
Sintronic Corp.
Sound Dynamics, Inc. D8, 9
Temtron Electronics D 1-9
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, FM 7.5 kw

See Adv. Page

Wilkinson Electronics, Inc.....194

AEL, Inc.
Allied Broadcast Equipment D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
Singer Products Co., Inc.
Wilkinson Electronics, Inc.

Transmitters, FM 8 kw

CCA Electronics Corp.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
Val-Tronics, Inc. D2

Transmitters, FM 10 kw

See Adv. Page

Broadcast Component Dist. Communication Medias.....200
NEC America, Inc.....119
Wilkinson Electronics, Inc.....194

AEL, Inc.
Allied Broadcast Equipment D 1-9
Bayly Engineering Ltd.
Broadcast Component Dist. Communication Medias D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
NEC America, Inc. Broadcasting Equip. Div.
RCA Broadcast Systems
Singer Products Co., Inc.
Sintronic Corp.
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, FM 12 kw

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Sintronic Corp.....105

AEL, Inc.
Allied Broadcast Equipment D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
McMartin Industries, Inc.
Singer Products Co., Inc.
Sintronic Corp.
Sound Dynamics, Inc. D8, 9
Val-Tronics, Inc. D2

Transmitters, FM 15 kw

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Broadcast Component Dist. Communication Medias.....200

Allied Broadcast Equipment D 1-9
Broadcast Component Dist. Communication Medias D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
McMartin Industries, Inc.
Singer Products Co., Inc.

Transmitters, FM 20 kw

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NEC America, Inc.....119
Wilkinson Electronics, Inc.....194

Allied Broadcast Equipment D 1-9
Bayly Engineering Ltd.
Broadcast Consultants Corp. D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Collins Div. Rockwell International
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
NEC America, Inc. Broadcasting Equip. Div.
North American Radio Corp.
RCA Broadcast Systems
Singer Products Co., Inc.
Sintronic Corp.
Sound Dynamics, Inc. D8, 9
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, FM 22.5 kw

Allied Broadcast Equipment D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Collins Div. Rockwell International
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
McMartin Industries, Inc.
Sintronic Corp.

Transmitters, FM 25 kw

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Broadcast Component Dist. Communication Medias.....200

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Wilkinson Electronics, Inc. 194

AEL, Inc.
Allied Broadcast Equipment D 1-9
Broadcast Component Dist.
Communication Medias D 1-9
Broadcast Equipment & Supply Co. D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Dyma Engineering, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
McMartin Industries, Inc.
Singer Products Co., Inc.
Sintronic Corp.
Sound Dynamics, Inc. D8, 9
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, FM 27.5 kw

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Sintronic Corp. 10

CCA Electronics Corp.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
Singer Products Co., Inc.
Sintronic Corp.

Transmitters, FM 35 kw

Allied Broadcast Equipment D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
McMartin Industries, Inc.

Transmitters, FM 40 kw

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Broadcast Component Dist. Communication Medias 200
NEC America, Inc. 119

AEL, Inc.
Allied Broadcast Equipment D 1-9
Broadcast Component Dist.
Communication Medias D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Collins Div. Rockwell International
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Mastertone Co., Inc. D 4
McMartin Industries, Inc.
NEC America, Inc. Broadcasting Equip. Div.
North American Radio Corp.
RCA Broadcast Systems
Singer Products Co., Inc.
Sintronic Corp.
Val-Tronics, Inc. D2
Wilkinson Electronics, Inc.

Transmitters, FM 50 kw

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Broadcast Component Dist. Communication Medias 200
Wilkinson Electronics, Inc. 194

AEL, Inc.
Allied Broadcast Equipment D 1-9
Broadcast Component Dist.
Communication Medias D 1-9
CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
McMartin Industries, Inc.
North American Radio Corp.
Singer Products Co., Inc.
Sintronic Corp.
Sound Dynamics, Inc. D8, 9
Wilkinson Electronics, Inc.

Transmitters, FM 55 kw

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Sintronic Corp. 10

CCA Electronics Corp.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
McMartin Industries, Inc.
Sintronic Corp.
Val-Tronics, Inc. D2

Transmitters, FM 70 kw

CCA Electronics Corp.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.

Transmitters, FM 100 kw

CCA Electronics Corp.
CSI Electronics, Inc.
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
North American Radio Corp.
Singer Products Co., Inc.

Transmitters, FM to order

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CCA Electronics Corp. 221
Cetec Broadcast Group 118
Collins Div. 31
Harris Corp. 17
Val-Tronics, Inc. 245
Wilkinson Electronics, Inc. 39

CCA Electronics Corp.
CSI Electronics, Inc.
Cetec Broadcast Group
Collins Div. Rockwell International
Fisher Burke Professional Audio D 8
Grinnan Fixture Co. D 1-9
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Maze Corp D6
McMartin Industries, Inc.
North American Radio Corp.
Rohde & Schwarz Sales Co.
Singer Products Co., Inc.
Sintronic Corp.
Val-Tronics, Inc. D2
Versa Count Engineering
Wilkinson Electronics, Inc.

Transmitters, HF to order

See Adv. Page

CCA Electronics Corp. 221

CCA Electronics Corp.

Transmitters, TV Microwave

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International Microwave Corp. 216

EMCEE Broadcast Products
Farinon Electric
GTE Lenkurt, Inc.
H. M. Holzberg Associates, Inc. D 1,2,5
Hughes Aircraft Co. Microwave Communications Products
International Microwave Corp.
Microwave Assoc. Inc.
Nurad, Inc.
RCA Broadcast Systems
Tayburn Electronics, Inc.
Tepco Corp.
TerraCom
Varian/Beverly Micro-Link Products

Transmitters, TV 1 Watt

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Howe-Yin Research Co. Inc. 208

Acrodyne Industries Inc.
CCA Electronics Corp.
EMCEE Broadcast Products
GTE Lenkurt, Inc.
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Howe-Yin Research Co. Inc.
Marconi Communication Systems Ltd.
Rohde & Schwarz Sales Co.
Tayburn Electronics, Inc.
Television Technology Corp.
Townsend Associates, Inc.
Varian/Beverly Micro-Link Products

Transmitters, TV 10 Watt

See Adv. Page

Howe-Yin Research Co. Inc. 208

Acrodyne Industries Inc.
CCA Electronics Corp.
EMCEE Broadcast Products
GTE Lenkurt, Inc.
Harris Corp. Broadcast Products Div.
Howe-Yin Research Co. Inc.
Marconi Communication Systems Ltd.
Rodelco Corp.
Tayburn Electronics, Inc.
Television Technology Corp.
Townsend Associates, Inc.
Varian/Beverly Micro-Link Products

Transmitters, TV 20 Watt

Acrodyne Industries Inc.
CCA Electronics Corp.
EMCEE Broadcast Products
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Rodelco Corp.
Tayburn Electronics, Inc.
Television Technology Corp.

Transmitters, TV 60 Watt

Acrodyne Industries Inc.
CCA Electronics Corp.
EMCEE Broadcast Products
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Rodelco Corp.

Transmitters, TV 100 Watt

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Howe-Yin Research Co. Inc. 208

Acrodyne Industries Inc.
CCA Electronics Corp.
EMCEE Broadcast Products
Harris Corp. Broadcast Products Div.
Howe-Yin Research Co. Inc.
Marconi Communication Systems Ltd.
Rodelco Corp.
Television Technology Corp.
Varian/Beverly Micro-Link Products

Transmitters, TV 500 Watt

Acrodyne Industries Inc.
CCA Electronics Corp.
EMCEE Broadcast Products
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Marconi Electronics Inc.

Transmitters, TV 1 kw

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Howe-Yin Research Co. Inc. 208

NEC America, Inc. 119
Philips Broadcast Equip. Corp. 66 67

Acrodyne Industries Inc.
CCA Electronics Corp.
EMCEE Broadcast Products
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Howe-Yin Research Co. Inc.
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
NEC America, Inc. Broadcasting Equip. Div.
Philips Broadcast Equip Corp.
Townsend Associates, Inc.

Transmitters, TV 2 kw

Acrodyne Industries Inc.
CCA Electronics Corp.
EMCEE Broadcast Products
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.

Transmitters, TV 3 kw

See Adv. Page

Howe-Yin Research Co. Inc. 208
NEC America, Inc. 119

CCA Electronics Corp.
Harris Corp. Broadcast Products Div.
Howe-Yin Research Co. Inc.
NEC America, Inc. Broadcasting Equip. Div.

Transmitters, TV 5 kw

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NEC America, Inc. 119

Acrodyne Industries Inc.
CCA Electronics Corp.
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
NEC America, Inc. Broadcasting Equip. Div.
Philips Broadcast Equip Corp.
Townsend Associates, Inc.

Transmitters, TV 6 kw

Acrodyne Industries Inc.
CCA Electronics Corp.
Harris Corp. Broadcast Products Div.
H. M. Holzberg Associates, Inc. D 1,2,5
Marconi Communication Systems Ltd.
Philips Broadcast Equip Corp.

Transmitters, TV 10 kw

Acrodyne Industries Inc.
Bayly Engineering Ltd.
CCA Electronics Corp.
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Marconi Electronics Inc.
Philips Broadcast Equip Corp.

Transmitters, TV 11 kw

Acrodyne Industries Inc.
CCA Electronics Corp.
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Philips Broadcast Equip Corp.

Transmitters, TV 12 kw

Acrodyne Industries Inc.
CCA Electronics Corp.
Harris Corp. Broadcast Products Div.
Marconi Communication Systems Ltd.
Philips Broadcast Equip Corp.
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Transmitters, TV 12.5 kw

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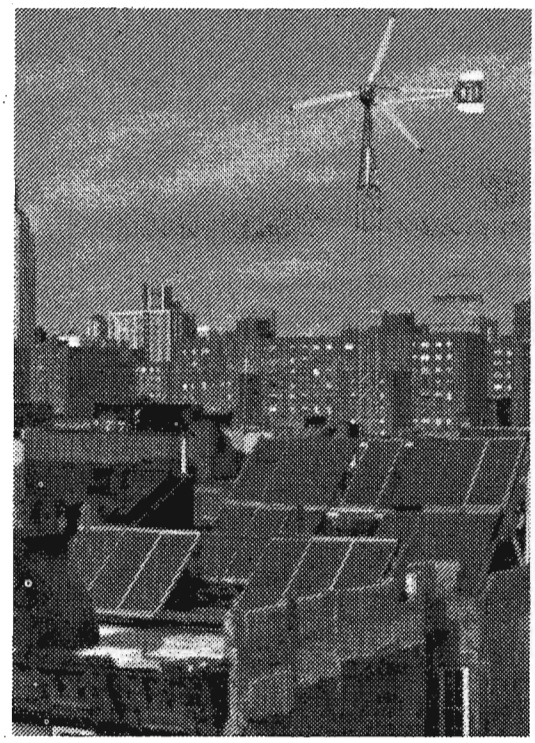
The New Yorkers Who Hustle the Wind.



Street life in a metropolitan area often inspires genius. And that genius can be funneled two ways—good or bad.

The 11th Street Movement in Manhattan's Lower East Side has funneled their genius on the good side with a unique energy saving project involving windmills and solar panels.

This project is just part of the Emergency Energy Conservation Program operated by the Community Services Administration. CSA has established many demonstration programs designed to find new and better ways to help the poor and elderly cope with what for them is a continuing energy crisis.

The program has a broad base, covering everything from development of low cost solar heating and wind generators to experiments with energy conserving farming technologies.

But helping people help themselves isn't an easy task. Simply put, it demands community support—Your support and the support of local and state governments.

If you think this effort is worthwhile, take action, contact your local Community Action Agency or Community Services Administration Washington, D.C. 20506.

There are thousands of people who want to help themselves. Like the 11th Street Movement—they learned how to catch the wind, so they'll no longer be a victim of the elements.

COMMUNITY SERVICES ADMINISTRATION

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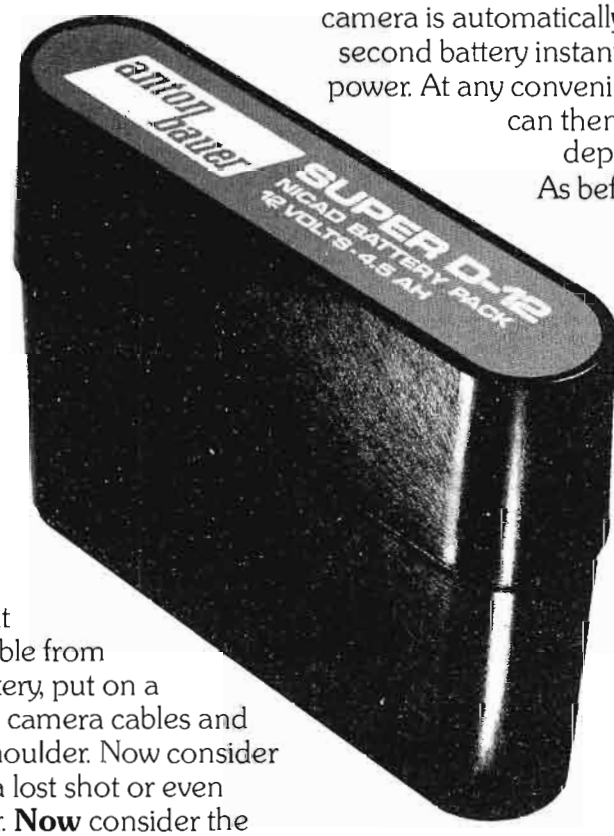
Perpetual Power

The First & Only Battery System That Never Runs Down

It is a fact that every battery must eventually run down, and usually does during your most important shot. We have changed all that. The new Anton/Bauer battery system will never run out of power, not during your most important shot, not during any shot.



The First System Approach

There are a lot of companies that make batteries, but only Anton/Bauer makes a battery system. Consider what happens when a conventional battery runs down, the cameraman must remove the camera from his shoulder, find a place to put it down, unplug the camera cable from the battery, unbuckle the battery, put on a fresh battery, fumble with the camera cables and lift the camera back on his shoulder. Now consider what this means in terms of a lost shot or even worse, an eternity of dead air. **Now** consider the Anton/Bauer System.

Quick-Change Modular System

Pull out the depleted battery module, push in a fresh one. The Anton/Bauer System is that simple and that direct. No plugs, no buckle, no fumbling. A fresh battery module in one second. But sometimes even one second is not good enough.

Perpetual Power

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station-to-station

Metal foil sensor triggers alarm at end of tape

By Cliff Graff, WSGW/WIOG-FM, Saginaw, MI

Our FM station, WIOG, uses a Schafer 902 automation system utilizing four Ampex 440 playback units. With the music format employed it is necessary to let each tape deck play the last selection before changing the tape. The necessity arose of having an alarm system that would indicate to the receptionist and also to the control room announcer that the tape had played the last selection. We decided to use a short metal foil strip on the underside of the tape at the end of the last musical selection to set off an alarm.

After checking with several equipment manufacturers, we couldn't locate a commercial sensor to mount on the Ampex units. The sensing units that were finally built were made from Switchcraft type-260 three-way standard phone plugs. The plastic end and the metal inside rod of the plug were removed and the insulated plastic inner sleeve was retained. The threaded and knurled part of the shaft on the lower end was turned down for better appearance. This was done by putting the shaft in a portable drill chuck and turning it down on a metal file.

To position the sensor, it was temporarily held in the proper place on the playback deck so the tape would just pass over the top of the sensor with a slight pressure in the "play" mode. With a pencil, the position was marked on the panel and a 3/16-inch hole was drilled in the center of the marked circle. A 2-inch, 6-32 bolt was then substituted for the removed center shaft with the flat head end making contact with the insulated end part of the phone plug. The plastic insulated sleeve was put on the threaded part of the bolt. Using a small insulated shoulder washer on the inside of the panel, the sensor was mounted on the panel so the lower part of the unit was making contact with the panel surface. With the sleeve and shoulder washer the end portion was insulated from the rest and could be electrically

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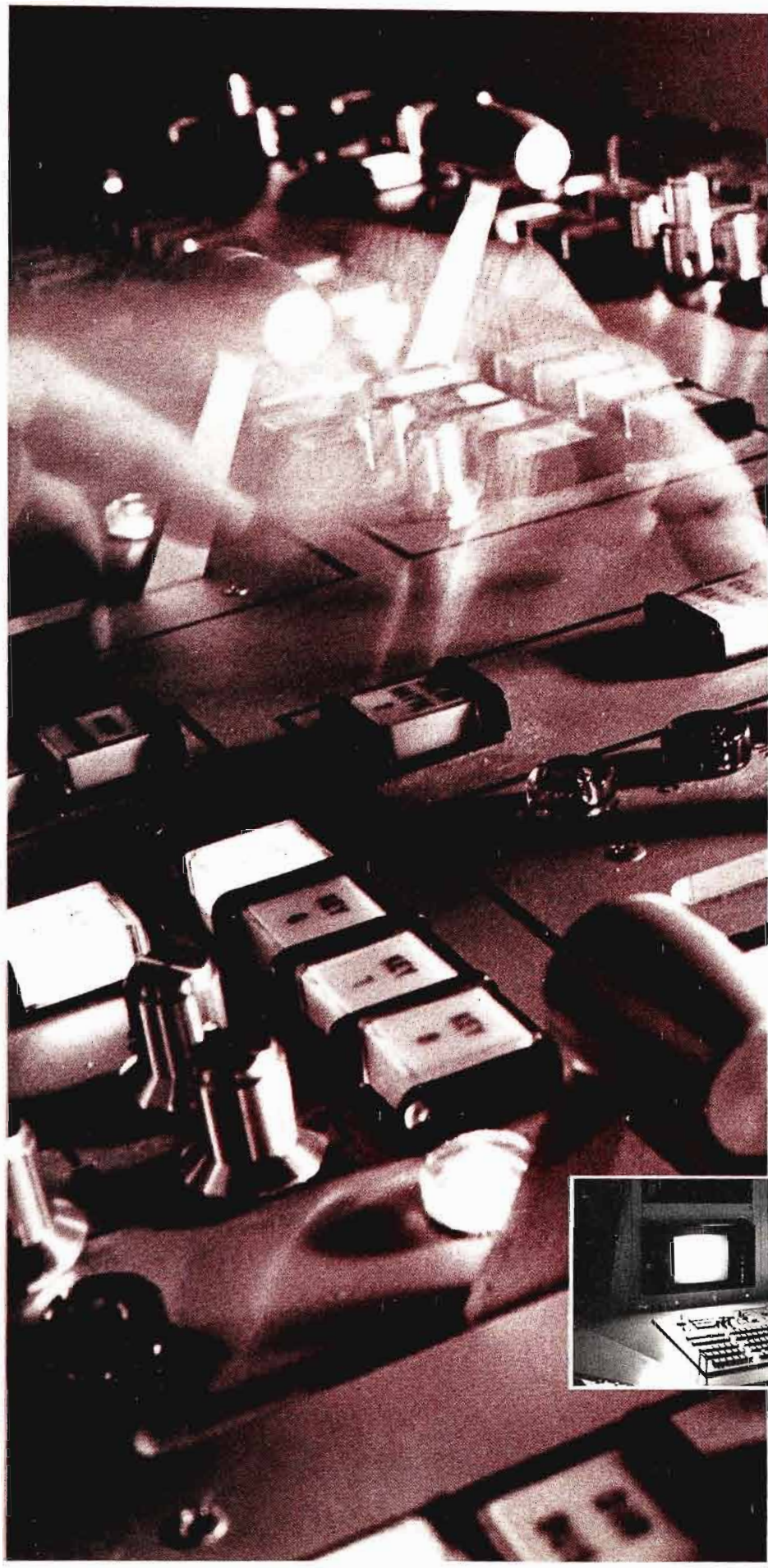

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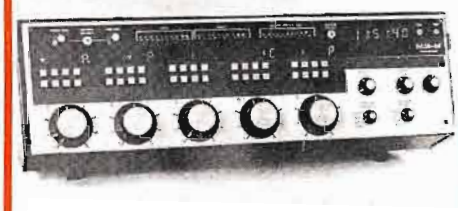

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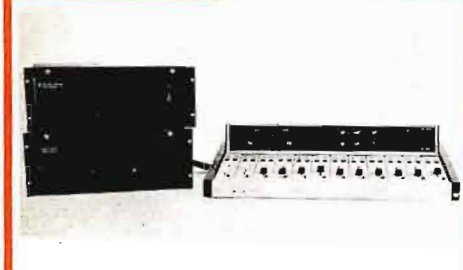
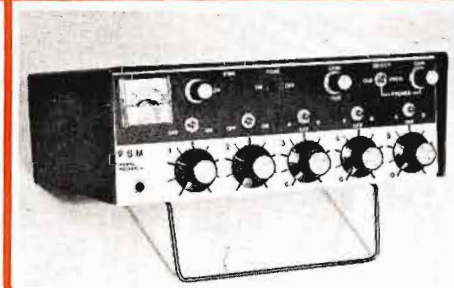


DC-12 SERIES AUDIO CONSOLES. A remote control console with low profile control head and rack mount electronics that may be located up to 90 feet away. Features 2 inputs per mixer, silent illuminated touch switches, dual channel (plus mono mix down channel on stereo), solid state LED VU meters, DC control of oll audio, patch panel input gain select, selectable solid state muting and switching, slide faders with dual cue entry and plug in electronics. Since the DC-12's are totally modular you may order any number of mixers and add on later. Twelve channels may be accomodated and an additional 8 may be added via the DC-12 extender. 4 year warranty. Price — $4,700 to $5,900.

SC-5, DC-5, & DC-8 SERIES AUDIO CONSOLES. This series of consoles, whether single or dual channel; table models or rack mount; 5 or 8 mixers, mono or stereo, feature illuminated touch-pad audio select switching, solid state LED VU meters, Simul-Q monitoring capability, full-range gain selects on each input, selectable solid state cue and monitor muting on all channels, and plug-in electronics. DC control of all audio with built-in relays for an-air lights and aux. muting. Options include 4 and 8 channel extenders, Simul-Q latching and remote control of AC equipment. These popular consoles have recently been up-dated to incorporate many new features. Price — $864 to $2,298.



PORTABLE CONSOLE. P5M — A full 5 mixer audio console in miniature. Bal. in & out, 8 inputs, 3 of which are mic/line selectable & individual compressors on mic channels #1 & #2. Tone gen., cue and monitor feed with gain controls & phones select with gain control. Last 3 channels equiped with Q switch & the first 2 channels provide muting. A folding stand is part of the unit and may be removed for rack mounting. +8dBm out nominally (+18dBm max); ±2dB, 20Hz to 20kHz; S/N —75dB high level and —62dB mic level. Max gain of 90dB and distortion of 0.3%. Compression/limiting range of 35dB and a slope of 50:1. 9¾" W x 9½" D x 3½" H. Price — $545.

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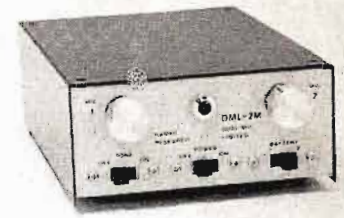
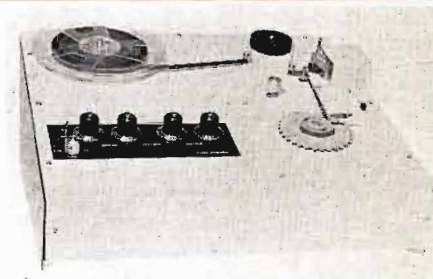
LINE AMPLIFIERS. The ideal solution for your line level problems can be found in one of the 4 different models offered. LA-2 (table top or rack) and LA-5S/10M: mono or stereo, balanced or unbalanced high impedance inputs, +21dBm maximum input level, +21dBm maximum output into 600 ohm balanced line, frequency response +0 —1dB 10 Hz to 50kHz, distortion 0.008% at +8dBm out. The LA-2 is a 2 channel amplifier. The LA-5S/10M is a modular rack mount unit with up to 5 stereo or 10 mono channels. The LE-3 is a 3 channel mono line amplifier with equalization for high and low frequencies and is also modular. Gain of all units, variable to +20dB. Price — $16 to $469.



DUAL MIC COMPRESSOR/AMPLIFIERS. Portable dual mono & stero mic limiters that amplify, mix, limit and control gain. The DML-dual mono is used where 2 separate mics must be independently amplified and compressed and mixed into a common 600 ohm output. Primary and backup batteries (or an optional AC supply). Includes tone generator & talkback ability. The DML-1S is an AC powered, stereo version. Input: —60dB nominal, —18dB max. Gain: 90dB max. Limiting Output Level: DML-2M, +10dBm. DML-1S, +18dBm or +8dBm. Balanced Inputs and Outputs. Dist.: 0.3%. Attack Time: 2 microseconds. Noise: 60dB below limiting output. Size 2½" H x 5¼" W x 8½" D. Price — $239 to $274.

MIC/LINE AMPLIFIERS. Dual function for microphone or line. The MLA series are ideal for remote broadcasts, churches, mixer expansion, and emergency situations. Front panel controls for mic or line selection and level. Mic input —60dB in for +4dBm out. Line input balanced bridging with gain variable +26dB. —18dBm in provides +8dBm out with an additional 13dBm of headroom. Distortion is 0.1% or less. Response: Mic channel ±2dB 20Hz to 20kHz. High level channel: ±1dB 5Hz to 30kHz. Inputs may be used bal. or unbal. XLR Mic connectors. Single or dual channel, table top or rack mount. Price — $128 to $195.

STUDIO MONITOR AMPLIFIERS. Exceptional reproduction with high performance and versatility. 7 different models to choose from. MA-7 (mono), MA-14 (stereo): 5W per channel into 8 ohms. Response: +0, —2dB 20 Hz to 19kHz at rated output. Distortion: 0.4% max. at 1kHz and rated output. Input: 5k unbalanced, 0.7V in for max. output. Table top or rack mount. SMA series: mono or stero, table top or rack mount. 25W RMS per channel into 8 ohms. Inputs: high Z balanced bridging. Response: ±1dB 15Hz to 90kHz at rated output. Distortion: 0.6% at rated output. Built in muting circuit with input and output level controls and bass contour adjust. Price — $96 to $269.



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Station-to-Station

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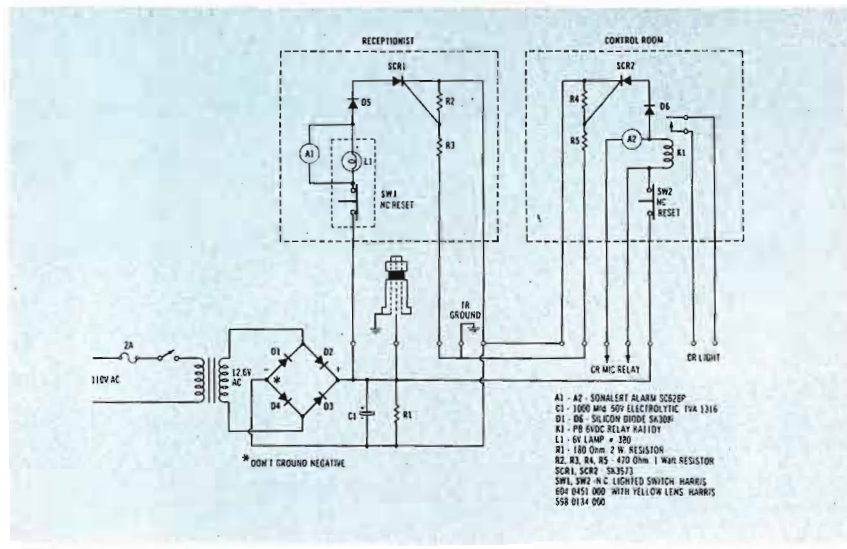

terminated on the inside of the panel with two 6-32 nuts and a terminal lug.

It just happened that the insulated part of the shaft and the grounded part junction were in the center of the passing tape, but if this is not the case in another type of tape playback, the addition of a couple washers or the application of a file to shorten it would make it right.

A 12 VDC power supply was made on a 3½-inch rack panel and mounted in the automation rack. The two SCR controlled alarms with reset switches were constructed, one for the receptionist and one for the control room. They both were made in BUD CU-2106A, 5¼ x 3 x 2 1/8-inch miniboxes. The one for the receptionist has rubber feet on it for setting on the table top. The one in the control room was mounted underneath the table top within reach of the announcer.

In this unit an octal socket and plug were mounted in one end of the minibox for connections for the red 110V, 75-watt light which was mounted over the clock and the mike relay connections and control wires.

SW1 and SW2 lighted NC switches were spares we had on hand for our Criterion Compacts. Any similar spring return switch could be used or if the visual feature is not desired, a NC switch could be used.

Relay circuit alerts operator of transmitter outage

By Randy Schell, chief engineer, KRGA-FM, Lake Charles, LA

From time to time, momentary power failures at our remote transmitter site knock us off the air. The power outages are usually short enough that by the time the operator notices that there is a problem, power has been restored, and all fail-safe indicators are back to normal. Standard procedure is then to blow the engineer out of bed with a hysterical phone call about transmitter explosions and broken-hearted fan clubs.

The solution was to provide the operator with an indication that a power failure had occurred and that the next logical step was to turn the transmitter back on. I was able to do so with a simple junk box gadget and one of the spare channels on my remote control unit. A DPDT relay is wired in a latch configuration so that the battery circuit is open when the relay is energized.

A power failure drops out the relay and closes the battery circuit, providing the operator with a reading on the remote control unit. When the transmitter goes down, it's a simple procedure to check the "power failure channel" to determine whether a problem exists with the transmitter, or the utility company has gone out to lunch.

The only circuit values to consider, obviously, are the battery and relay coil. Since optimum full scale metering voltage on our remote control unit is 2 VDC, I used a D cell. The resultant readout is more

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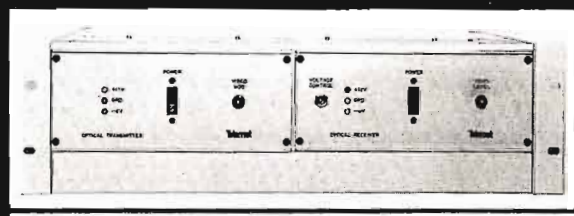
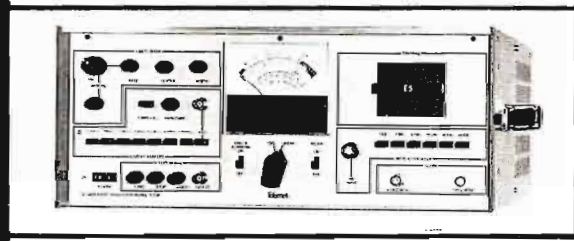
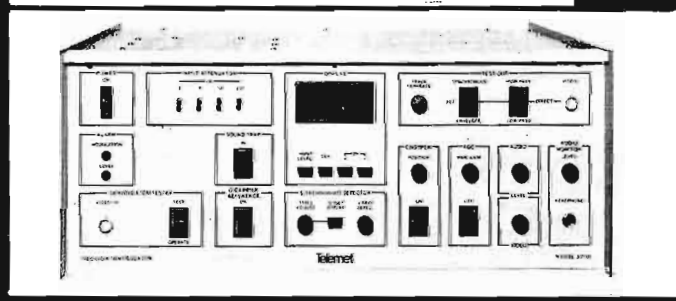
From Distribution Amplifiers To Fiber Optics.







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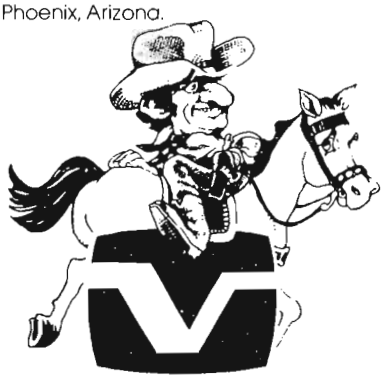

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Station-to-Station

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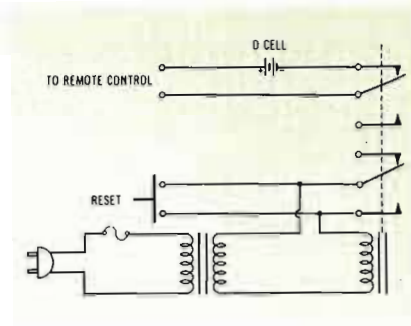
than sufficient to let the operator know that he is definitely seeing a power failure indication. The only consideration made as far as the relay was concerned was that I wanted to use a low voltage coil. This makes it possible to reset the device from the studio site without the presence of 110V on the back of the remote control.



DA modification reduces gain, allows higher input

By Herbert Dean, Maine Public Broadcasting Network, University of Maine

When our FM studio acquired new audio distribution amplifiers, television inherited a sorely needed bucket of Ramko model 2080 DAs.

These units, as they stood, had too much gain, so I modified them. Also the + and - outputs were not balanced because the 500K-ohm "output balance adjust" pots had been replaced with fixed resistors.

To correct the output imbalance, we changed the 330K-ohm resistors to 200K-ohm on the non-inverting output IC sections. Then, we fed a 1000 Hz tone through the unit and checked audio output balance with an audio voltmeter, measuring each output to ground.

To lower the gain, we removed the 330K-ohm resistors on the input ICs and replaced them with 100K-ohm devices. To set the "CMR adjust" pot, we fed in a 1000 Hz, 0 dBm tone, from ground to both inputs tied together. Then we set the "output level adjust" pot to maximum and connected an audio voltmeter to an appropriate output. Then the CMR pot was adjusted for minimum output as measured on the audio voltmeter. It's touchy, and spraying the pot with contact cleaner will help.

When modified, these units have approximately 12 dB of gain, and can be comfortably turned down to a negative 5 dB gain. We bridged the inputs onto 600-ohm lines at 0 dBm, running unity gain, padding to lower any output. The maximum output level is 15 dBm before distortion starts to show.

For the cost of 12 half-watt resistors per card, and the time, this has made a very useful modification. As things worked out, next time around I would reduce gain even more by lowering the value of both feedback resistors in the output stages.

If you don't modify all the cards, be sure to mark them well.

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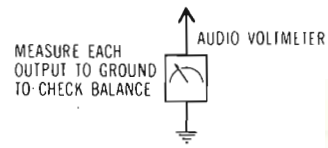

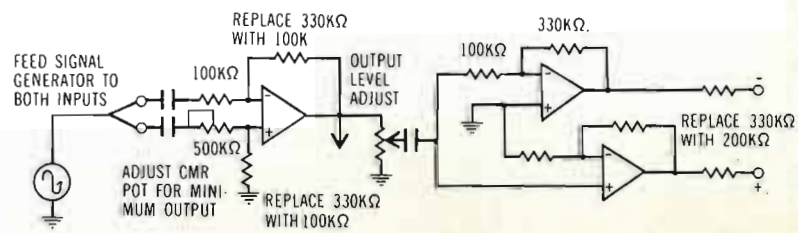

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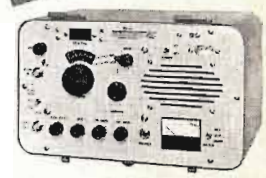
OIB-1 OPERATING IMPEDANCE BRIDGE – For antenna system measurements under transmitter power. May also be used as a conventional bridge.

OIB-3 OPERATING IMPEDANCE BRIDGE – The new OIB-3 features direct reading of 'R' to 1000 Ohms and 'X' to 900 Ohms. The OIB-3 also contains an integral rf amplifier.



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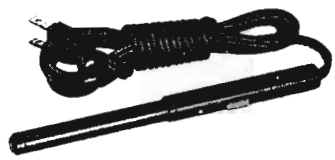
TYPE 642-21 Degausser is similar to the 9205A except it is limited to erasure of 10½ inch reels. This unit is recommended where size and cost are limiting factors.



TYPE 8905 Magnetic Erasing Pencil is an excellent tool for erasing limited, small areas of tape or film and for demagnetizing record/play heads. In program material, words, complete sentences, and even syllables may be erased. This unit is equipped with a press-to-operate switch on the handle.

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Station-to-Station

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Remote control/timer for several cart machines

By John E. Shepler, chief engineer, WROK/WZOK, Rockford, IL

Many radio stations face the common situation of how to hook up an electronic timer to several cart machines. Each machine must reset the timer when it starts.

At WZOK, I believe we have developed a unique method to accomplish this using the circuitry shown. The timer is a very common one made by ESE. The cart machines are ITC single-play models, but the circuit should be adaptable to other makes.

The circuit, consisting of R1, D1 and C1, is constructed for each machine. The parts may be assembled inside of the plastic remote control plug supplied by ITC. The circuit consisting of L1, C2 and C3 is to filter RF and other electrical noise and is constructed inside the timer. The timer reset lines from each cart machine may then be connected at a junction box of some sort and fed to the input of the filtering network (C2). Be sure to use shielded wire for the reset lines to avoid false triggering of the timer. The dotted ground line means that the cart machines and the clock are connected to station ground; but, to avoid ground loops, a wire is not necessarily connected directly between them.

The advantages of this circuit over other designs are: 1. The operation is completely silent, and there are no relay clicks for a microphone to pick up. 2. The remote start buttons will reset the timer. This can be handy for previewing cartridges without losing the elapsed time on a cartridge playing. If this feature is not desired, omit the diode (D1). 3. As many or few cart machines as desired may be hooked to the timer reset circuitry. 4. Other equipment, such as reel-to-reel recorders, may be similarly interfaced. The interface for an ITC-850 is identical to the circuit shown, but the pin numbers are different.

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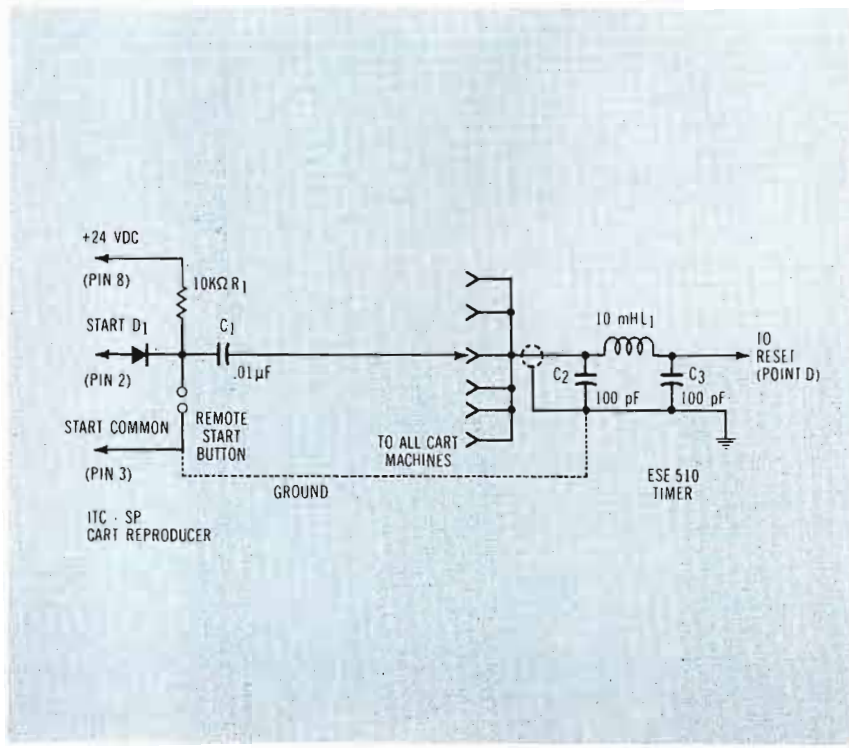

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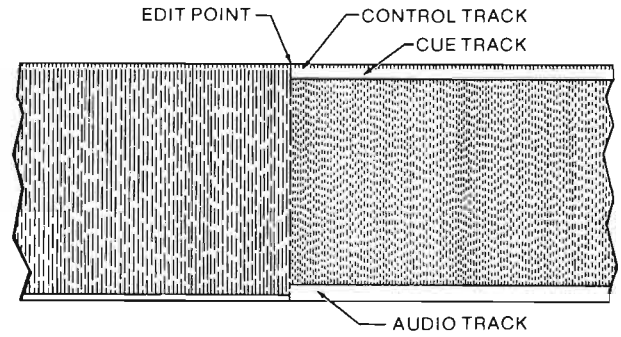

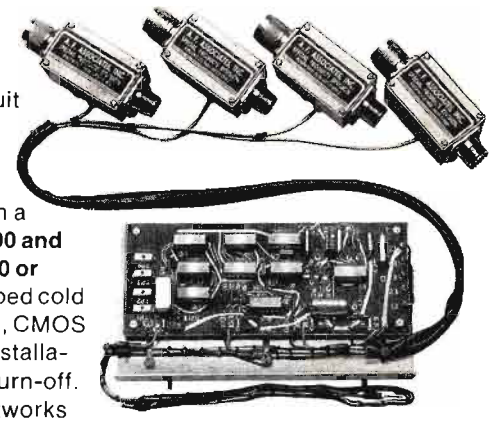

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Station-to-Station

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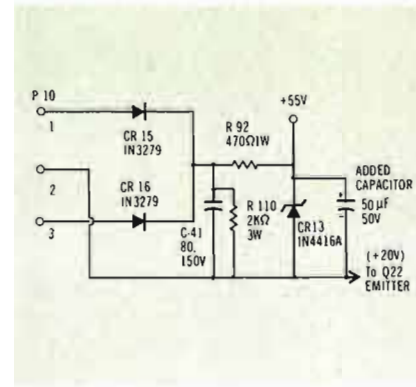
Circuit mod cures video monitor picture problem

By John A. Bredesen, director of engineering, University of Wisconsin

We have experienced a problem with hum bars in the picture on our Ball Brothers TE-9 video monitors. Investigation showed a 2V ripple across Zener diode CR-13, the regulator for the piggy-back supply riding on top of the regulated 20V. This 35V, when added to the 20V, provides the higher voltage needed for Q4, the kine video driver.

The cure, which will also work on the model TE-12 monitor, was very simple; we added a 50 microfarad, 50V electrolytic capacitor directly across the Zener, CR-13.



Event indicator for TCR-100s is inexpensive

By Daniel L. Woods, engineering supervisor, WJXT-TV, Jacksonville, FL

Figure 1 shows an event indicator that I designed and built for a RCA Model TCR-100 Video Cartridge Recorder. The idea for this circuit comes from the fact that TCR-100's only know the first and last event in a sequence. If the machine does not know where it is in a sequence, neither will the operator loading it.

Many operators do not understand the functions of the TCR-100. They can reduce the number of events in a sequence accidentally while the only indication is the amount dialed on the sequence thumbwheel. For example, an operator can advance the belt in automatic operation, and the TCR-100 counts each move as an event. The operator then flips the sequence thumbwheel to what is called for, thinking this is correct. Also, a rejected cartridge during the load cycle counts as an event. The end result is the TCR-100 stopping on air before expected. Of

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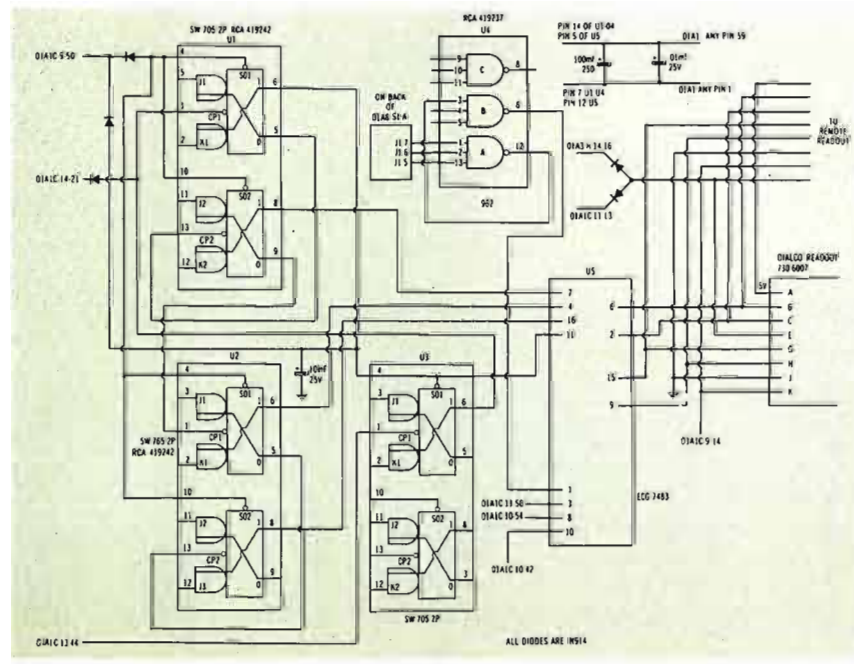

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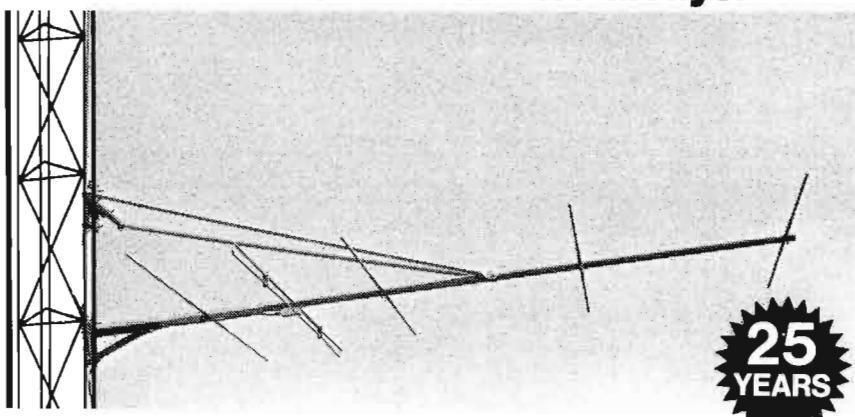

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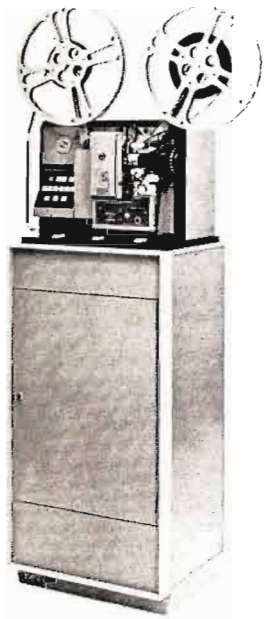

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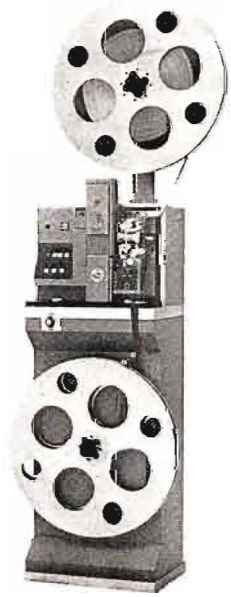

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Station-to-Station

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course, the operator blames the TCR-100, and the maintenance person goes bananas trying to find the intermittent problem that really is not there.

The circuit employs a flip-flop counter and a full adder with look-ahead carry. The only components not used in the TCR-100 are the full-adder IC and the Dialco readouts. The readouts come assembled on a PC board with the decoder-driver for $15. It is .6 inch high, requiring only 5-volt power.

A binary full-adder can be used for subtration if the subtrahend is complemented and added to the minuend. The carry in will always be high in this particular case, since the subtrahend will always be the same or less than the minuend.

The flip-flop counts the number of events in a sequence as they occur. The TCR-100's tape counter does the same, except it does not count the first event. U3 takes the first event indication from the TCR-100 and applies it to the counter. U3 is reset by the output of pin 6 of U1 going high for a count of one. The counter receives the available tape counter reset from the TCR-100.

U4 makes the most significant digit for the minuend input of the full adder. The TCR-100's sequence thumbwheels only have seven positions with 3-bit gray-code output. Positions 1 through 7 are normal gray code. Position 8 has a gray-code zero output. When all three bits are gray-code zero, U4's output goes high for the most significant digit.

The difference output of the full-adder is displayed on the readout as the number of events on the thumbwheel minus the number of events the TCR-100 has pulsed from the counter pulse circuitry. The readout actually counts down to zero as the events are run. The decimal point of the readout is triggered by the last event indication from the TCR-100.

We have one readout mounted on the blank EPIS panel, and another on the end of 110 feet of cable in master control near the switcher. The readouts are blanked out unless the TCR-100 is in the automatic and AB modes. The master-control switcher and the TCR-100 operator can both verify correct operation by observation of the readouts. The total parts cost of the entire circuit is approximately $50. Ours paid for itself the first hour it was in operation.

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Revox remote control indicators

By Allen H. Burdick, KXTX-TV, Dallas, TX

A need arose for six sets of remote controls for our Revox A 77 tape machines at C.B.N. Northeast Radio. Due to space limitations, all six sets needed to be mounted in a 3½-inch rack panel. Because we had plans to tie the decks to an automation system in the future, remote indicators were deemed a necessity.

Today's logic chips have provided the functions needed with high reliability small size and for less than the cost of relays suggested in the past. Each set of remote controls and associated indicators derive their power from their associated Revox machine and are independent from one another. This allows flexibility concerning the

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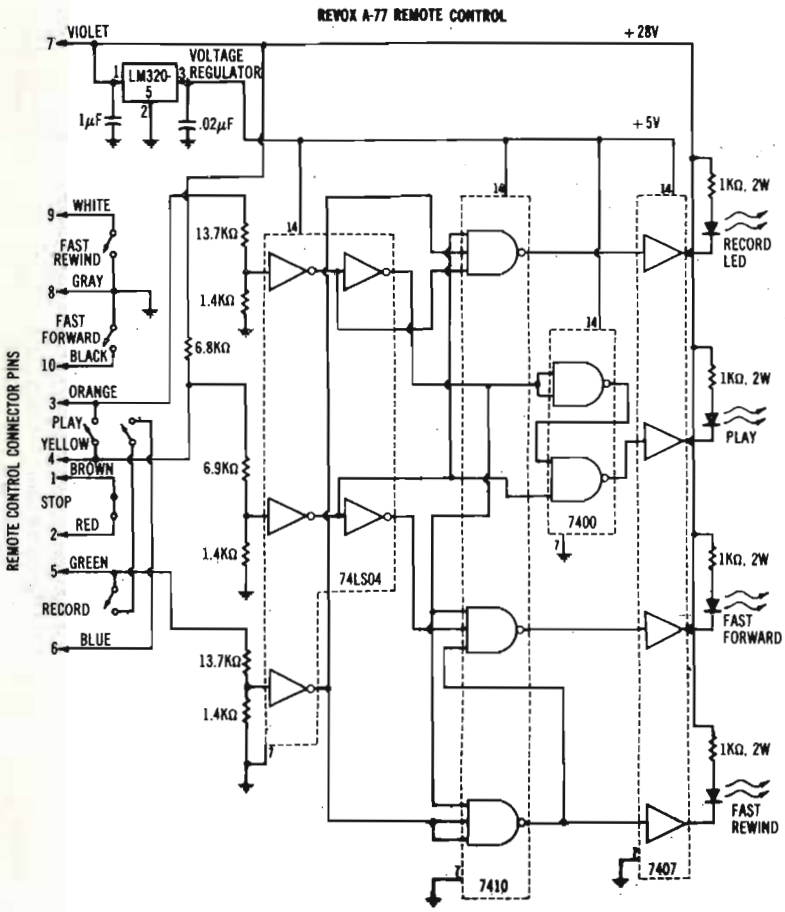

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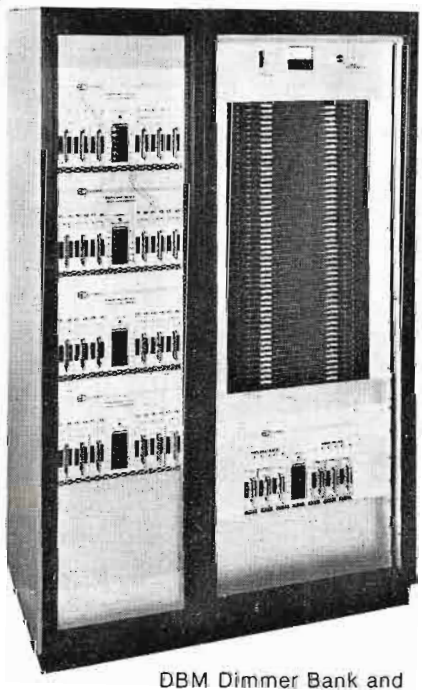

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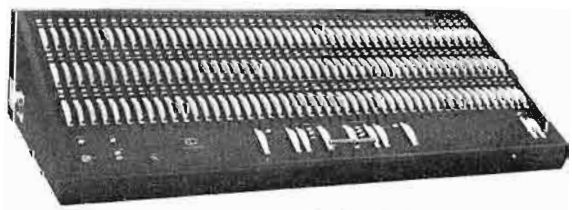

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Station-to-Station

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number of machines, machine down time and freedom from intermachine ground loops if the individual subsystem grounds are allowed to float.

Specifically TTL logic was chosen due to its very low cost and relative RF immunity. Either a low power or a low power schottky device must be used for the hex inverter (74LS04) package due to the low input bias current requirements of the logic input voltage dividers.

The output buffer must be a standard device due to the current sink requirements of the LEDs. The other chips can be any one of the 7400 series TTL family. Almost any LED can be used; however, the highlight output types are preferred. A small heat sink is required for the five volt regulator, we used 1.5-inch by 2-inch pieces of aluminum from an old chassis.

With the addition of another chip, another logic input divider, etc., a stop indicator can easily be configured. It was felt, however, that to eliminate any possible operator confusion, a machine that was not in operation should have no lights lit.

A dummy plug can be purchased from Revox if you desire an extra. Belden #8456 is a nice ten-conductor cable that will fit with a little knife trim work on the plug.

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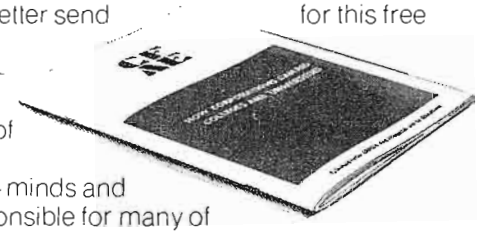

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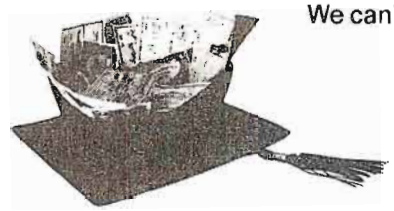

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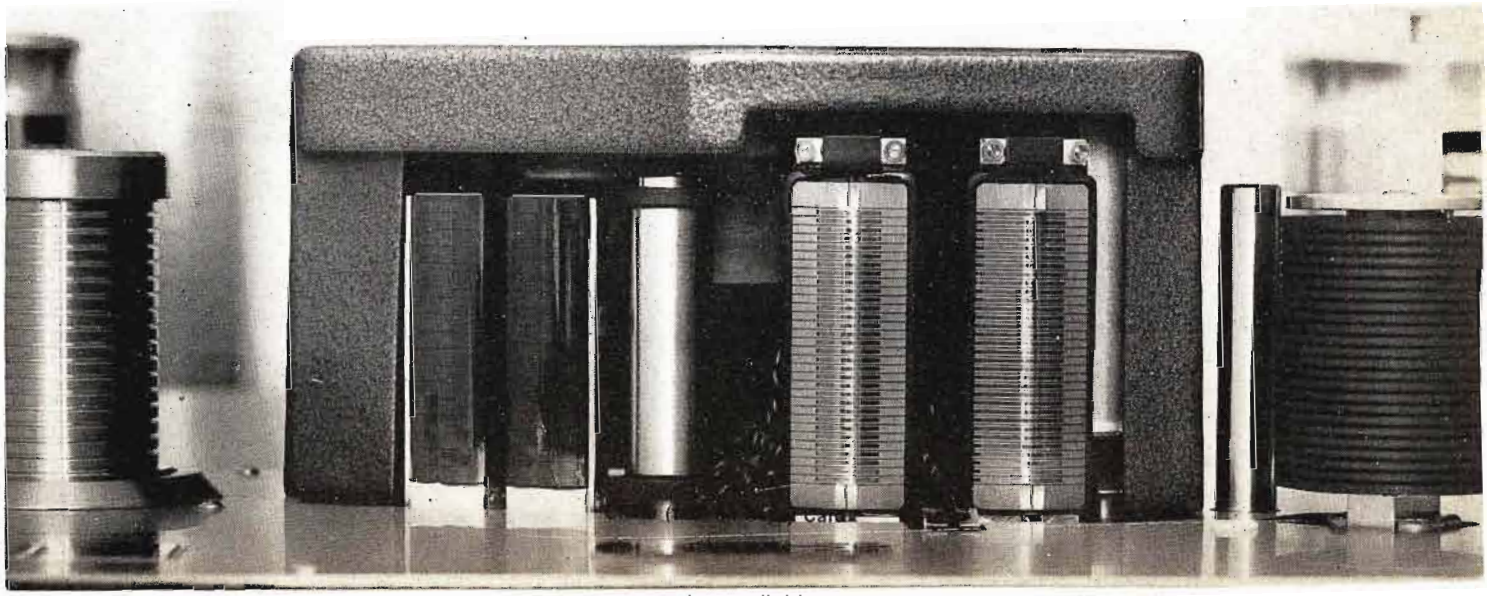

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Results of the FM signal processing survey

By Dennis Ciapura

As part of *Let's Preserve That Musical Timbre* in the April issue of **Broadcast Engineering**, a brief questionnaire was included which I hoped would provide some insight into why many FM stations sound the way they do. In listening to hundreds of FM stations around the country, I have often been amazed at the lengths some stations have gone to gain every fraction of a decibel of loudness, often with a disastrous effect on the audio fidelity. So, some very basic questions arose.

Assuming that chief engineers of these stations would be at least as irritated as most listeners are if

continued on page 204

Surprisingly, only 2% of all respondents think that most FMs sound good!

FM SIGNAL PROCESSING QUESTIONNAIRE

My occupation is: ☐ Engineer ☐ Programming ☐ Mgr.

	Yes	No
1. In my opinion most FMs sound: ☐ poor ☐ acceptable ☐ good		
2. I agree that FM stations should be processed for best fidelity?	☐	☐
3. I feel that maximum loudness should be the primary objective?	☐	☐
4. How is your station set up?		
☐ A. Maximum loudness		
☐ B. Maximum fidelity		
☐ C. Compromise of both		
5. Is the station's sound the result of programming dept. influence?	☐	☐
6. If yes to #5, would the engineering dept. have a different objective?	☐	☐
☐ A. Less processing		
☐ B. More processing		
7. Do you listen to your station often at home for entertainment?	☐	☐
8. Do you listen to other FM stations often?	☐	☐
9. Type of home stereo:		
☐ A. Very good component system ($1000+)		
☐ B. Moderate quality system ($300+)		
☐ C. Modest system (under $300)		
10. Size of your radio market ☐ small ☐ medium ☐ large		

Name (optional) _____ Station (optional) _____

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Processing survey

continued from page 202

they could hear the effects of over-processing, one might conclude that most chief engineers do not have very good stereo systems at home or do not listen to their own stations for entertainment.

On the other hand, if the chief engineers do have good quality monitoring equipment at home and are not happy with the sound, perhaps engineering at the station is influenced by other people. If so, would the chief engineers adjust the station for best fidelity rather than maximum loudness?

The questionnaire was designed to go directly to the heart of each question. Since the replies did not have to be signed (although some respondents did sign and give call letters), I felt the response from the letters would be very candid, and candid it was. I noted some trends that seemed to explain why some FM stations just don't sound as good as they could.

Response

A total of 80.4% of the respondents are engineers, while 13.7% are managers and 5.9% are programming people. Since the vast majority of people returning the questionnaire are engineers, the results are obviously reflecting an engineering point of view as well as an influence of **Broadcast Engineering's** high engineering readership.

Broadcasters who feel that most FMs have acceptable sound represent 52.1% of the total, while those who think most FMs sound poor amount to 44.9%. Surprisingly, only 2% of all respondents think that most FMs sound good! (Remember, these are broadcasters who are

continued on page 206

...most have sound ranging from poor to acceptable.

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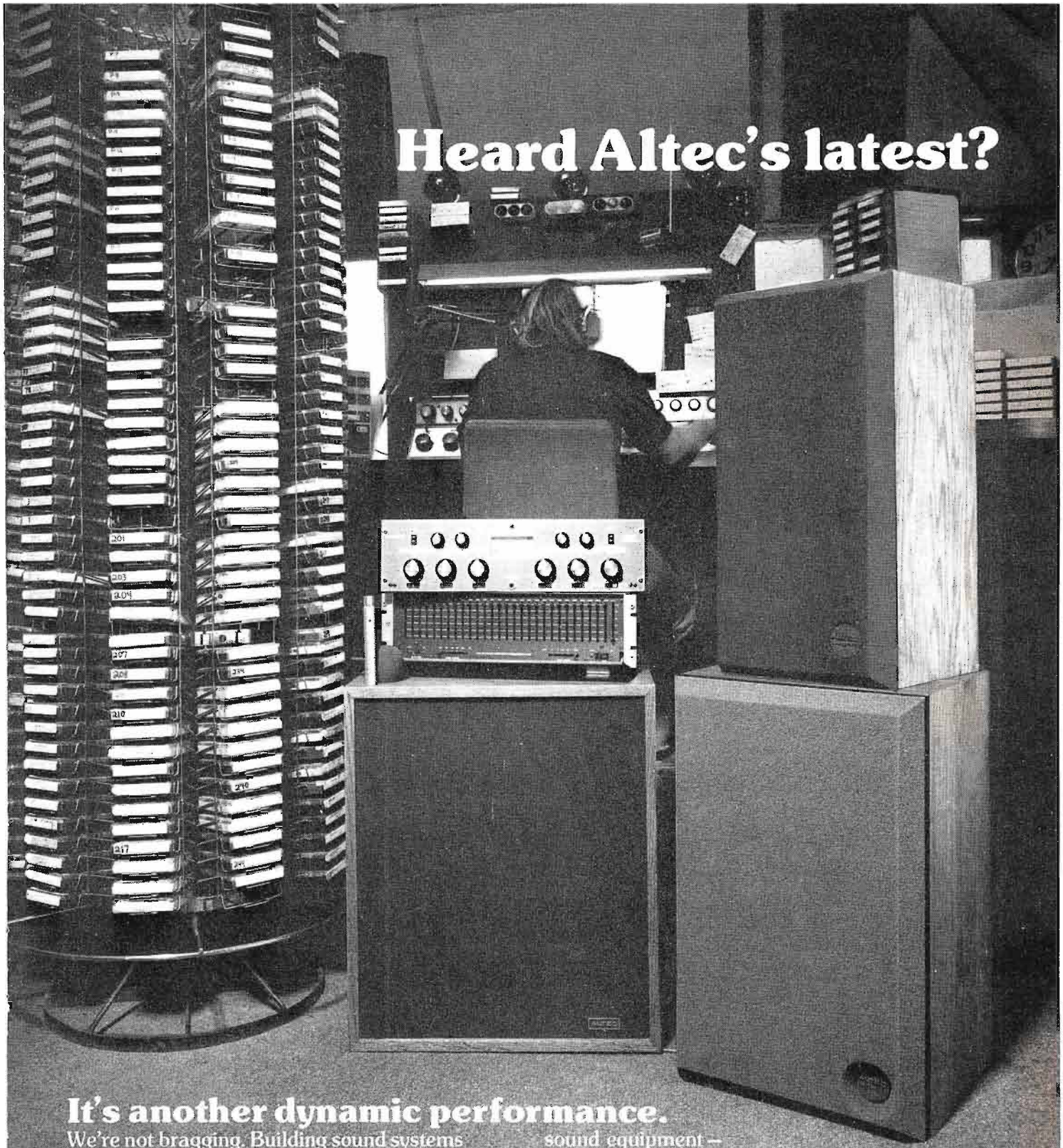

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Processing survey

continued from page 204

critiquing the quality of their own industry's production.)

When asked if FM stations should be processed for best fidelity, 86.7% said yes. However, when asked if maximum loudness should be a primary objective, 97.7% said no. So, from this, one can conclude that while the vast majority of the respondents feel that fidelity is important, an even larger percentage are opposed to engineering for maximum loudness as a primary objective.

Influence

Of people who responded, 27.6% said their stations are engineered for maximum fidelity, 14.9% are set up for maximum loudness, and 57.4% are engineered for a compromise of both. Not too surprisingly, 55.3% of the broadcasters said the station's sound was the result of programming department influence. However, when asked if the engineering department would have a different objective, 80.9% said that they would employ less processing.

Next, I asked if the respondents listen to their station often at home for entertainment and 63.8% said they do. Of those who listen to their own stations at home, many must listen to the competition as well, with over 76% saying they listen to other FM stations often.

Broadcasters who have very good stereo systems in the $1000+ price range amount to 44.7% of the total while those who have moderate-quality systems in the $300 range represent 42.5%, and only 12.8% have modest systems worth under $300. (In other words, 87.2% of the broadcasters have stereo systems in the $300-and-up price category.) I feel the $300 figure is a good

...while the vast majority feel that fidelity is important, an even larger percentage are opposed to engineering for maximum loudness.

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...if the engineer had his way, he would reconfigure the audio chain for better fidelity.

reference point in today's dollars because it describes the minimum type of system that usually will have good enough fidelity to make sonic imperfections annoying.

Market size

The largest group of respondents, 42.6%, work in medium-size markets. Broadcasters from large markets represent 29.8% of the total and small market broadcasters accounted for 27.6%.

I acknowledge that this survey is far from comprehensive and that the results may be interpreted differently by readers and analysts. However, the limited survey conducted does supply some interesting data and the results could be used to allow engineers and station managers to reconsider their priorities and how they wish to best serve their audience.

A direct conclusion appears to be that most FM stations are processed for a compromise between good fidelity and maximum loudness with the result that most have sound ranging from poor to acceptable. The programming director has a lot of influence on how the station is engineered. However, if the engineer had his way, he would reconfigure the audio chain for better fidelity, possibly because most broadcast engineers have good enough equipment at home and listen often enough to be unhappy with the sound of their station.

However, there are those who would review the same data and simply conclude that broadcasters who responded to **Broadcast Engineering's** questionnaires have good stereo, are interested in better audio fidelity, and as professionals, would like to engineer their own stations for better audio. So, it is up to you to decide whether we have succeeded in identifying the latest industry trend or merely described the typical **Broadcast Engineering** questionnaire respondent. □

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Wow & Flutter test signal	No	No	Yes
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Stereo Matrix Switch (L,R, L+R, L-R)	No	No	Yes
Switch to remove signal and terminate line for S+N/N	No	Yes	Yes
10 dB, 1.0 dB, 0.1 dB Step Attenuators	No	Yes	Yes
AUDIO ANALYZER	Combined with Generator	Combined with Generator	Separate Unit
Harmonic Distortion Mode	Yes	Yes	Yes
Automatic Nulling	Yes	Yes	Yes
Automatic Set Level	Yes*	Option*	Yes
Intermodulation Distortion Mode	No	Option	Yes
AC Voltmeter Mode	Yes	Yes	Yes
Stereo Phase Meter Mode	No	No	Yes
L/R Amplitude Ratio Mode	No	No	Yes
Wow & Flutter Meter Mode	No	No	Yes
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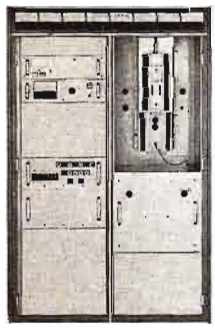

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The society is looking forward to a busy and exciting winter with many chapters planning special membership drives to kick-off the season.

Final plans for regional conventions are being made: chapters 1, 2 and 22 to be held September 29 in Syracuse, New York; chapter 20 to be held October 12 and 13 in Pittsburgh, Pennsylvania; chapter 35 to be held October 24 through 26 in Louisville, Kentucky; and chapter 40 to be held October 27 through 29 in San Francisco, California.

Meetings for newly forming chapters have begun in the St. Louis area (contact Bill Martin, [314] 946-7755) and in Yakima, Washington (contact Dick Rose [509] 966-0391).

The following people have contacted the national office with an interest in starting a new chapter and would appreciate hearing from anyone in their areas who would like to participate: Albany, New York, Bill Humphrey, (518) 474-5823; Bryan, Texas, David Jones, (713) 822-1133; Cedar Rapids, Iowa, Rick Plummer, (319) 377-0612; Charleston, West Virginia, Mike Grady, (304) 925-4986; Cleveland, Ohio, Raymond Smith, (216) 344-3354; and Toledo, Ohio, Steven Molnar, (419) 535-0024.

The national office is busy processing new member applications as well as applications for the October certification exams that will be given in various cities throughout the country.

CHAPTER REPORTS

Chapter 3—Kansas

The June 13 meeting was held at KMUW, Wichita State University. The program, presented by Larry Driskill of Electro-Voice, was an overview of microphone selection, theory and application technique

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and was combined with audio recordings to illustrate the results of microphone application. A tour of KMUW, the WSU public radio station, followed the meeting.

Chapter 5—Atlanta, Georgia

Bill Williams, lightwave transmission network manager for Southern Bell, presented the June 19 program on methods of using optical fibers to expand transmission capability through the use of light. Light is immune to cross talk and interference from any energy fields and will last longer than presently used materials.

Chapter 9—Phoenix, Arizona

The July 27 meeting was held at KTVK-TV and featured a program by Don Bowdish and Bruce Rayner of Grass Valley on the EMEM Microprocessor.

Chapter 11—Boston, Massachusetts

The June 20 meeting was held at the Boston Fish House in Newton. Ira Goldstone, Dave Underhill and Ross Kauffman of WCVB-TV gave a slide show and tour of the new remote van, the "Hippo", (see **Broadcast Engineering**, August 1978).

Chapter 14—Connecticut Valley

A dinner meeting, courtesy of Sam Schwartz of R & S Electronics, was held June 28 at Cavey's in Manchester. Information on the policy and direction of the FCC was presented by Gerry Sarno, regional director, and Vin Kanjunski, his assistant.

Chapter 21—Spokane, Washington

The technical meeting was held July 6 at KSPS. Reports given include: new satellite receiving antenna, receiver and program terminal by Ron Valley; videocassette account of erection of new KXLY-FM CP antenna by Mr. Wyatt; and high voltage cable terminations by Vince Hoffart.

Chapter 35—Kentucky

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continued on page 210

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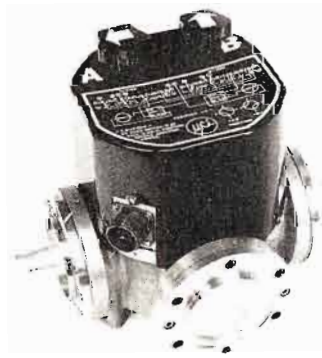

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SBE

continued from page 209

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Chapter 39—Tampa Bay Area

The July 10 meeting was held at WFLA-TV and featured a demonstration of Insta-cam system and editing equipment. Also shown was a videocassette made at Cypress Gardens by the WFLA engineering crew.

Chapter 40—San Francisco Bay Area

The July 19 meeting was at KQED's earth-satellite station atop San Bruno Mountain. A tour of the terminal equipment and antenna was given by KQED's staff along with a discussion of the problems encountered with construction and anticipated advantages for the PBS network. The regional convention was set for October 27 to 29 at the LeBaron Hotel in San Jose.

Chapter 41—Central Pennsylvania

The summer social meeting was held July 20 at the Charles W. Baker estate on the Juniata River. The program "Field Engineering—Good for What Ale-s Ya!" included a demonstration of the effects of short term exposure to solar radiation and enjoyable stimuli on the morale of broadcast engineers.

Chapter 43—Sacramento, California

The July 25 meeting was held at KXTV Studio C. Kevin Dauphinee and Bob Peterson of Dolby Laboratories presented information and examples of Dolby noise reduction equipment.

Chapter 45—Charlotte, North Carolina

The July 10 meeting featured Carl Venters, general manager of WPTE-TV and Radio and state EBS chairman, who presented a program on

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the current status of the EBS network.

Chapter 46—Baltimore, Maryland

The regular monthly luncheon/seminar was held June 21 in the Looking Glass Restaurant. Dave Grimes and Jerry Preston of Harris Corporation provided the program. Grimes defined the automation needs of AM and FM broadcast stations and led the listeners through the history of automation systems from basic task-oriented switching devices to microcomputers.

The program for the July 19 meeting was presented by Frank Rybak of Radiation Devices Company on the practicality of Fiber Optics for transmission of all types of signals. Equipment developed to date, fiber optics, splicers and associate conductors were also displayed.

Chapter 47—Los Angeles Area

The June 13 meeting was held at KNXT-TV in Hollywood. Mike Fehlig of Moseley Associates presented a program on aural STL basics. He explained the factors that contribute to a successful aural STL system path planning, antenna gain, polarization, etc.

The July 12 meeting was held in the Louis B. Mayer Theater at Loyola University in Westchester. Dick Burden, local broadcast consultant and Ed Greene, freelance mixer, presented a program on television audio which covered everything from production of a program to the transmission and reception.

Chapter 49—Springfield, Illinois

The program for the May 23 meeting was given by Wally Warren, product analyst from RCA. He discussed RCA's philosophy and activity in the development of FM broadcast equipment since the early days of Major Armstrong's introduction of the medium.

continued on page 212

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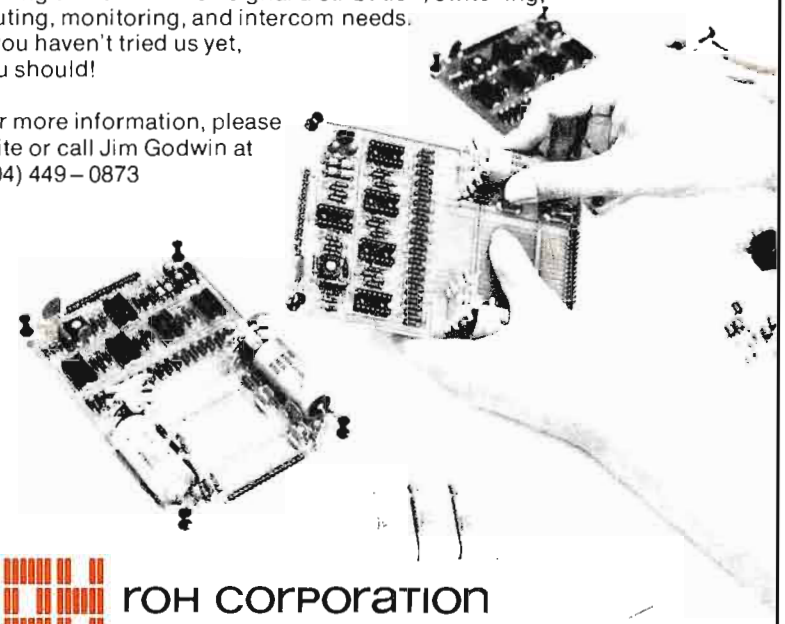

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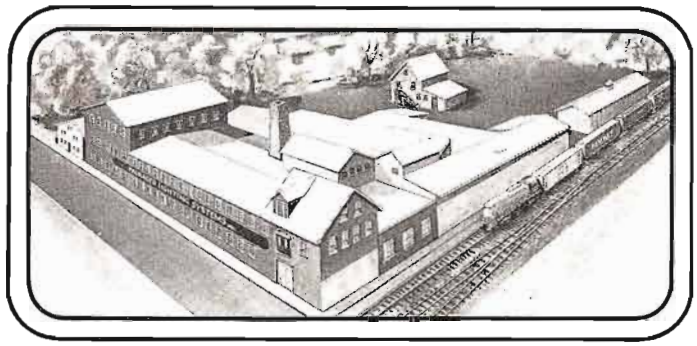

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SBE

continued from page 211

Elections conducted at the June 27 meeting at Sangamon State University resulted in Jim Newbanks as chairman for a second term; Bob Miller, vice chairman; and Tom Brock, secretary-treasurer for the coming year. Bill Ellis showed slides and discussed the work done on the 1,580 foot Convocom tower at Bluffs, Illinois which collapsed during the Easter Sunday ice storm.

Chapter 50—Fort Collins, Colorado

The June 5 meeting at Colorado State University featured a discussion led by Jim French on some FCC reference books listing various engineering parameters. A Tektronix videotape on dynamic gain was presented with a discussion. Last meeting for the summer.

Chapter 51—Tri Cities, Washington

The June 1 meeting was a joint meeting with the Tri Cities Broadcast Council and was designed to bring both of the organizations into a closer working relationship. Bill Johnson and Bob Dietsch of the FCC discussed the reorganization of the field division of the FCC to create better efficiency and the subsequent improvement in the FCC's public image. They also discussed the FCC's view of the responsibilities of broadcast engineers.

Chapter 52—Central Ohio

The June 29 meeting was held at Warner's Westland Studio in Columbus and provided an opportunity to observe the Warner Cable System new studio facility.

Chapter 53—South Florida

The July 25 meeting, held in the studios of WCKT in Miami, featured Duane Tuttle of Adda Corporation who spoke on their electronic still store and demonstrated still store equipment. Alan Sternberg, operations manager at WCKT discussed production advantages of electronic storage. □

See page 236 for information on becoming a certified broadcast engineer.

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zoom in!

This is the official column of the American Society of TV Cameramen (ASTVC). The ASTVC can be contacted by writing to: P.O. Box 296, Sparkill, NY 10976. (914) 359-5985.

Take 1...The SMPTE invites your participation

The Society of Motion Picture & Television Engineers has organized a committee titled Working Group on Control for Interface of Television Broadcast Studio Equipment.

The committee will make available to the industry an optional control interface for videotape recorders, film chains, character generators, still stores, audio tape decks, audio consoles, video switchers, frame synchronizers, time base correctors, noise reducers and digital effects.

This list is not intended to be rigorous or inclusive—only representative. The approach would be to have the industry reach an agreement on the style, protocol, format, and language of a digital communications scheme to permit all equipment in the industry to talk, listen and command, if necessary.

The SMPTE invites participation from all who are substantially concerned and who can contribute to the work.

The ASTVC suggests that those interested contact the chairman, Robert W. McAll, Vital Industries, 34 Autumn Lane, Hicksville, NY 11801.

Take 2...Digital Readout...or... "What's New, Pussycat?"

(Editor's Note: The following article by Morton Morje, ASTVC's Associate Director of PR)

It has been learned on "good authority" that there is a concerted move on the part of the networks to protect the privacy of TV cameramen by granting them total anonymity. In effect this means that no matter how hard you may look at the credits following each and every studio production, you will never learn the true identity of those noble cameramen and women who have played some role (large or small) in the production of said program. There may, on occasion, be cover names indicated on the crawl such as the following examples: Coordinator of Cables: Timothy T. Tibia, or Current Conductor: Volta Grosso,

continued on page 214

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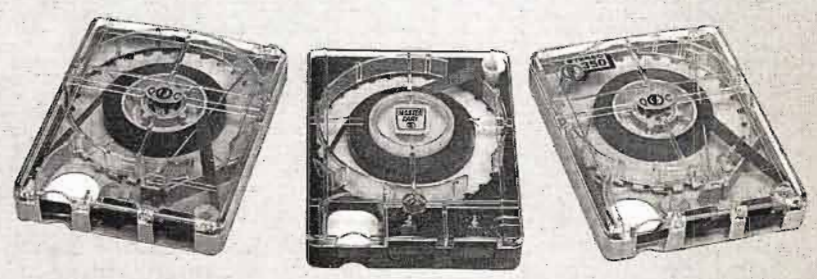

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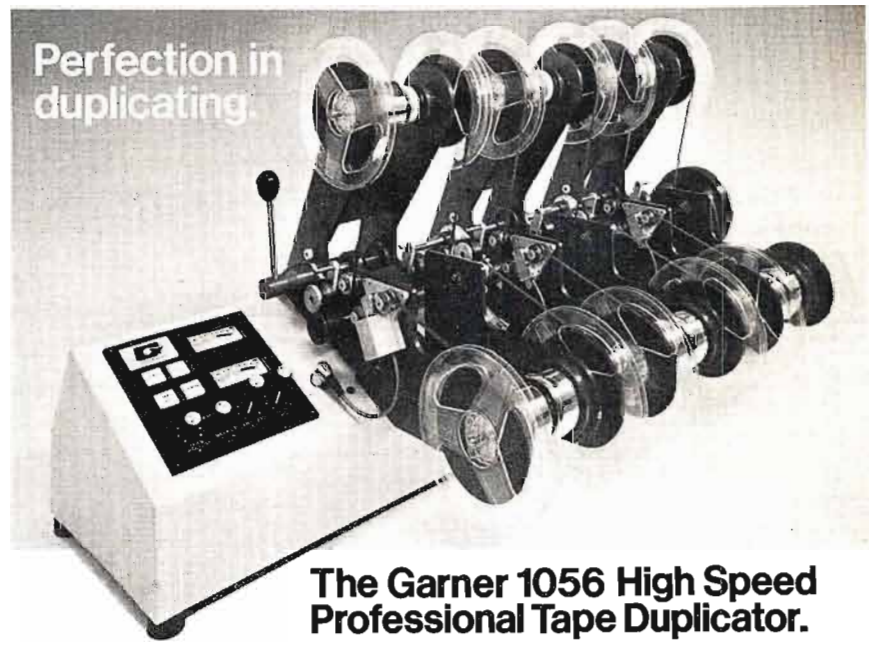

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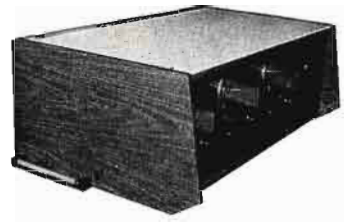

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Zoom in!

continued from page 213

or Writer's Assistant: Ima Penncarrier, or Refreshment Researcher: "Fats" Victualis, or 3rd Assistant Production Assistant: Mary Louise Chutzpa, and on and on and on. We are pleased to let you in on this trade secret: those are camerapersons names that have just flashed by on your screen. The producers have gone to great length to insure the complete privacy of all concerned camera operators. We thank them for their thoughtfulness and our only fear is that the day may come when they decide they can no longer afford to give us this protection.

In the What's New department, we were delighted to receive the newly printed professional-aids produced by one of our Charter Corporate Sponsor members, Achro-Video Ltd. of West Nyack, NY, very hand tools of the trade, made even more attractive by virtue of the ASTVC logo emblazoned on the cover. These will be sent to all members (let us know if you need additional ones for colleagues). Vernon Dyer, our liaison member with the British Guild of TV Cameramen, writes and extends an invitation to any or all ASTVC members to join them at the upcoming IBC '78. (That's International Broadcasting Convention, for the benefit of you uninformed Yanks.) It will be held at Wembley near London (you remember Wembley; she had no sister) September 25th thru the 29th. If you plan on being in the UK about that time, and would like to take advantage of the very kind offer of help with your accommodations, etc., write to us and we will contact our cousins in the guild. We are sure you will find a most gracious welcome awaiting you. Wish we could go—tried flying once, but found we were much better at hopping (short distances only). Vern also asks if we would care to trade an ASTVC T-Shirt for a (slightly used) Guild T-Shirt. Inasmuch as we don't, as yet, have

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any such T-shirt, we wonder if you (our readers) would have anything that you would care to trade for a (British) Guild T-shirt (very slightly used)?...Fade to Black!

Take 3...Characters generating or What are they doing now?

ABC's Stu Goodman (and ASTVC's director of organizational liaison) is no longer ABC's. Stu has gone into his own production unit. If our information is correct, Stu is working on an underwater documentary. In any event, we hope that the new organization keeps its head above water and that all concerned do well!

Former member of the ASTVC board of directors, and one of TV's most eligible bachelors, John Cordone, has now settled into his new position as an ABC technical director, bidding goodbye to his zoom and focus handles. Jim Schoonmaker, our regional representative at WCIX-TV, and Bob Brooks, ASTVC's southeastern regional vice president at WPEC-TV, are busier than a one-handed cable-puller, planning the details for an upcoming ASTVC seminar in the Miami area. Bill Garrigus, our regional representative at WTVI, is asking interested operations people to contact him for new chapters in the Charlotte, NC area.

John Lehman at WSYR-TV writes, "Hope that Bob Brooks of PEC will do another article on lighting boards. Information that means anything to the people who have to use them, is hard to obtain." We believe that Bob will write some more informative material.

Vernon Dyer, The British Guild of Television Cameramen's liaison with the ASTVC, reminds us that their offer still goes, namely, to assist any and all ASTVC members who may happen to be in Great Britain at any time, and especially for the International Broadcasting Convention

continued on page 216

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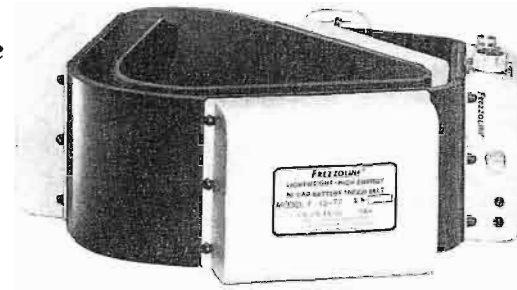

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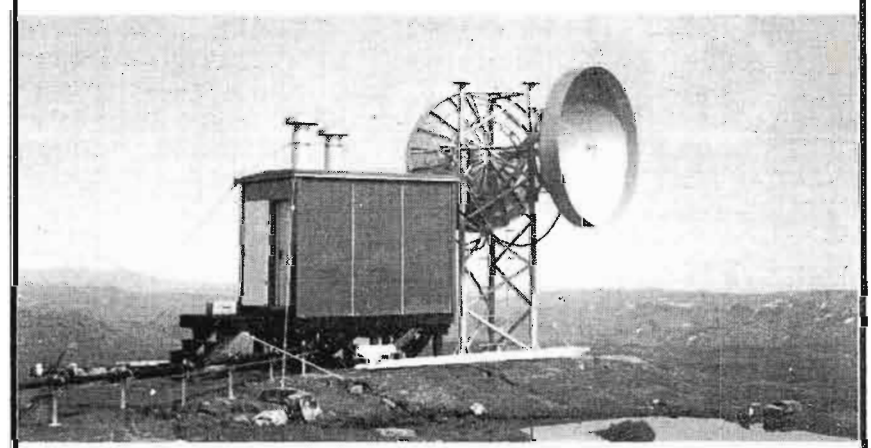

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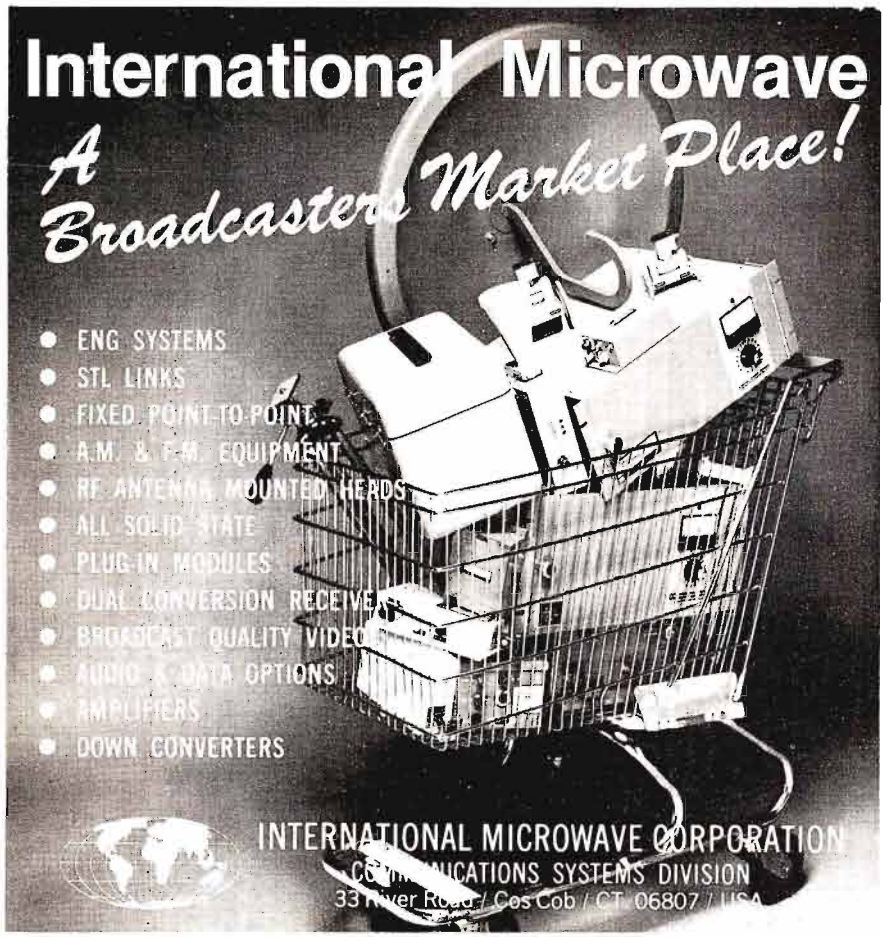

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Zoom in!

continued from page 215

which is scheduled for September 25-29 at Wembley. Write us for all relevant data if you plan a visit to the United Kingdom. (Vern still is trying to swap a Guild T-shirt for anything resembling an ASTVC T-shirt. Any takers?)

Sol Bress (CBS) is off the honeymoon merry-go-round and on the commuter express from his cottage in Philadelphia to his engineering assignment in New York City...and back each evening. Who said cameramen don't know of love? Speaking of love, Al Brown has kissed Walter Cronkite's news program goodbye and has become a daily observer—through the viewfinder—of a CBS soap. He says it's a "challenge." So is six months in the slammer.

Maureen Mulvaney is doing a stint on NBC's new **America Alive** show in Radio City's studio 6A. For you youngsters, that was once the home of Perry Como and the late Fred Allen in the good old days of radio.

Collette Hunt, ABC videotaper, is wearing her pencils to the nub trying to come up with a new design for the information booklet for the ASTVC. Talented kid! (WOOPS! Forgive us N.O.W., we mean talented young lady.) Which reminds us, some bright young thing wrote advising us to change our name to the American Society of Camerapersons and then he signed his letter John Doe, Chief Cameraman, WXXX-TV. It figures!

Take 4...ASTVC members to be offered group legal insurance

It's still in the negotiating stage, but there's a plan in the works to offer our membership a pre-paid legal plan—something like hospital/medical insurance. Further detailed information will be forthcoming in an ASTVC newsletter. Should you have any feelings on the proposal, jot down your thoughts and send them along to: Director, Member SVCS, ASTVC, Box 296, Sparkill, NY 10976...**fade to black!** □

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from blue bananas to sag tails

40 days of boating?

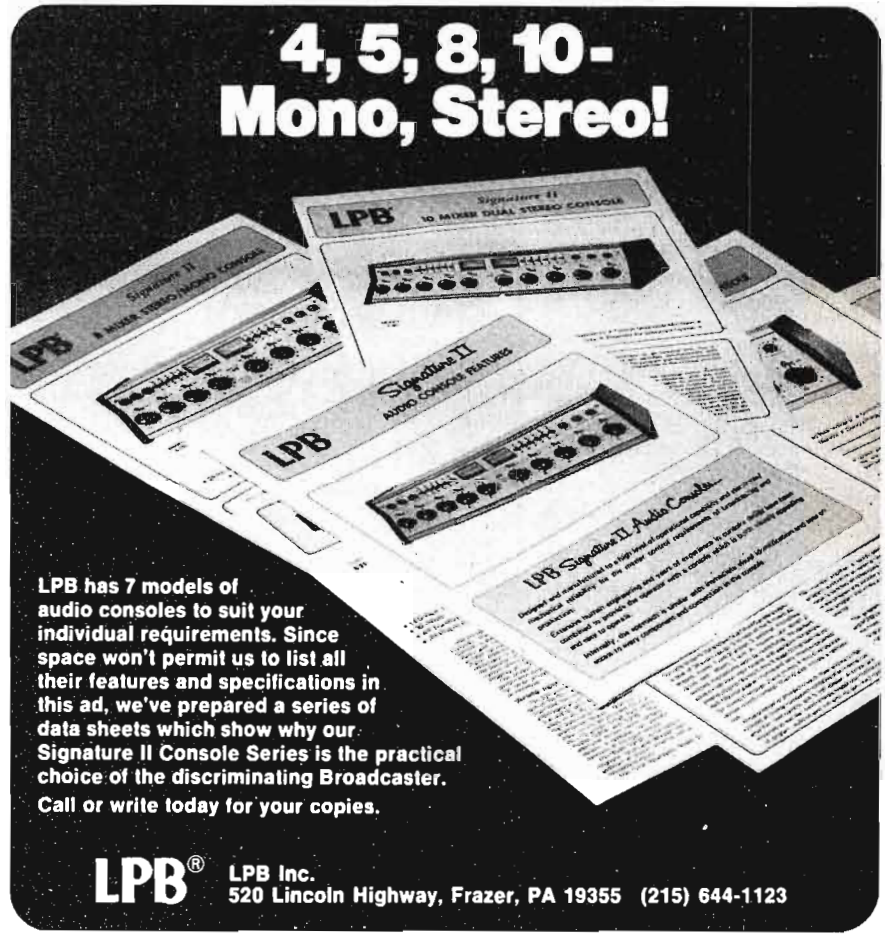
I know you've heard enough from me but I'll give you one more anyway. Very often people are broken up by an odd unplanned combination of events. I was working at KCBS in San Francisco one morning when the George McManus feature, *A Question of Religion*, was followed by a commercial produced by bay area announcer Tom Campbell who was doing a hard sell spot for a boat dealer. It sounded like this: "And so those are the latest events to take place in the search for Noah's Ark, this is George McManus. Roar Roar (sound of outboard motor)! Let's go boating!!!
Roy Trumbull, Laney College

Patchcord poetry

I had a high school boy training on some equipment for audio productions and was wondering just how well he was taking all the patching, riding-gain, miking, etc., when I discovered the following lyric that he had penned during a slow production. In a way, he's right:

The patch-cord
by Gary Wilde

A Patch-cord is a long gray snake,
Twisting and turning through all the grass blades and microphone stands.
His life exists of being plugged into and out of holes.
Is pulled by the plug, by the skin, or end.
"How much longer must I live this life?",
He asked, his voice full of strife.
"Don't worry," said the recorder,
"You're doing fine."
But that night, he short-circuited;
And blew out his mind.
Dave Wall, Engineer, Waltronics



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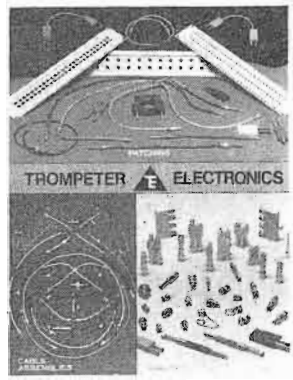

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Industry news

continued from page 20

be left to the judgment of radio station licensees.

NAB pointed out that the commission has correctly held that it cannot involve itself in format changes without trampling the First Amendment and the no censorship provision (Section 325) of the Communications Act. The Act specifically forbids the commission to compare the relative values of the program formats involved in license transfers.

Television commercials solicited

Entries are now invited for the eighth annual United States and Canadian awards competition, the U.S. Television Commercials Festival has announced.

The festival is the world's largest competition devoted exclusively to competitive judging of television commercials. Last year over one thousand commercials were entered.

Eligible for entry are 16mm film or ¾-inch tape commercials produced or aired within the past year nationally, locally or regionally. Entries are placed in one of 73 subject categories and one of 12 production technique categories.

Deadline for entry is October 1, 1978 with awards to be presented in Chicago on November 16, 1978.

Additional information and entry forms may be obtained by writing the festival's headquarters at 1008 Bellwood Avenue, Bellwood, IL 60104.

NAB backs marketplace determination

The NAB, in comments filed with the FCC, agreed with the National Telecommunications and Information Administration's (NTIA) position that "distress sale" prices of broadcast stations should be determined by the marketplace instead of by the FCC.

The NAB said the commission should not consider attempting to determine a fair market value and what discount should be made in such cases. "The FCC has neither the expertise nor the statutory authority to promulgate permissible monetary boundaries for 'distress sales.' "

Revised broadcast forms

The FCC has issued a revised listing of acceptable editions of broadcast applications and report forms.

The following are now available for use:

- Form 303-R—Application for Renewal of License for Commercial AM or FM Radio Broadcast Station. (April 1978. December 1977 edition may also be used.)
- Form 309—Application for Authority to Construct or Make Changes in an International, Experimental Television, Experimental Facsimile, or Developmental Broadcast Station. (February 1978. June 1977 edition with EEO Supplement may also be used.)
- Form 311—Application for Renewal of an International, Experimental Television, Experimental Fac-

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simile or a Developmental Broadcast Station License. (February 1978. February 1977 edition with EEO Supplement may also be used.)

In addition, the following forms require the addition of a revised EEO Supplement: 301, 303, 315, 340 and 342.

NAB asks for rehearing on WBAI case

In a friend-of-the-court filing, the NAB, along with other media organizations, has supported the Pacifica Foundation request that the U.S. Supreme Court rehear the "seven dirty words" case.

NAB also suggested that whether or not the rehearing is granted, the Court should clarify its opinion regarding Section 326 of the Communications Act.

FCC extends compliance date

The FCC has extended its compliance date for its new rules for remote pickup broadcast stations to June 1, 1979.

On June 29, 1976, the Commission amended its remote pickup rules requiring all such stations to meet authorized bandwidth and maximum frequency deviation specifications by August 31, 1978.

The commission said that because of the large number of units to be modified, it is not possible to bring all the equipment into compliance by August 31. The 9-month extension should allow licensees time to upgrade their equipment.

FCC begins PSA inquiry

The FCC has begun an inquiry into broadcasters' practices involving public service announcements (PSAs).

The questions to be considered fall into two general categories: (1) information about the present use of PSAs by broadcasters and (2) the possible role of PSAs.

In view of its particular concern with children's programming, the commission said the inquiry also would include questions on PSAs directed to children (under 12 years of age) and youth (from 12 to 18 years).

To gather more information, the commission asked for comments on 26 specific questions, such as:

- How many PSAs did a station usually air on a weekly basis?
- What criteria did broadcasters generally employ in determining which PSA to air?
- How useful were PSAs in serving the public?

Pointing out that its rules did not impose a PSA obligation on broadcasters but specified only that they proceed in good faith, the FCC invited comments as to whether a specific requirement should be imposed.

Comments are due October 23, and replies November 22. □

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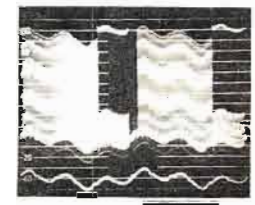

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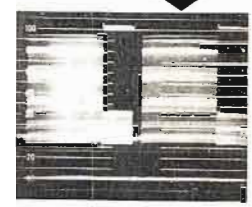

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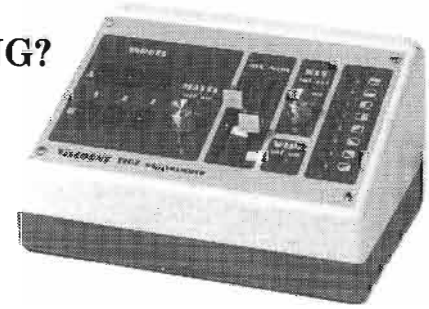

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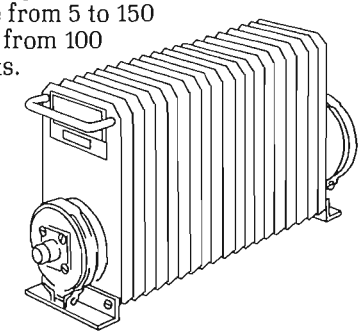

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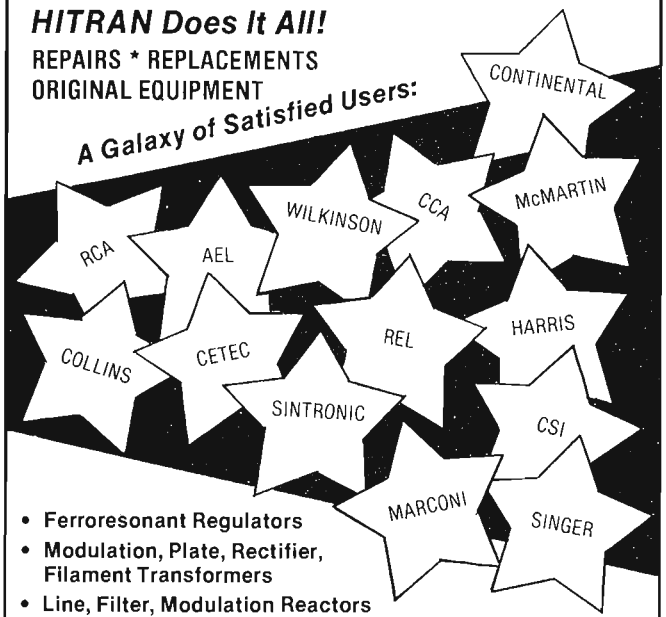

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new literature

Wiring products

Panduit Corporation—An 8-page condensed catalog covering the full line of wiring products for electrical contractors is available free. Illustrated information is included on wiring products for industrial, commercial and residential construction and maintenance applications.

Circle (360) on Reply Card

Test equipment

U.S. Instrument Rental—This telecommunications catalog provides information on telecommunications test equipment available for rent or lease. The catalog includes state-of-the-art telecommunications test equipment for microwave, transmission, mobile radio, carrier, computer protocol, data communications, cable fault, VTRs, cameras and monitors, and general purpose testing requirements.

Circle (361) on Reply Card

Fiber optics

Information Gatekeepers—136-page *Fiber Optics Handbook and Market Guide* contains state-of-the-art papers on fibers, cables, detectors, sources, connectors, subsystems and systems. The handbook contains a listing of manufacturers and products of fiber optics and communications.

Circle (362) on Reply Card

Cables

Belden Corporation—180-page catalog documents standard product lines in seven individually indexed categories: multi-conductor cables; computer cables; bonded and laminated flexible flat cables; hookup wire; coaxial cables; convenience-packaged wire and cable products and assemblies; and shielded/unshielded cords and portable cordage.

Circle (363) on Reply Card

Video supplies

Comprehensive Video Supply Corporation—A 148-page catalog contains descriptions of all types of video supplies, accessories, tools and time-savers.

Circle (364) on Reply Card

Broadcast equipment

Cohu—Short-form catalog number 6-545 describes Cohu's current line of broadcast television products now available. It includes photographs and descriptions of all equipment with listings for processing and accessory equipment also.

Circle (365) on Reply Card

Leasing programs

U.S. Instrument Rentals—A 4-page brochure on the

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advantages of leasing electronic test equipment. It shows examples of the different leasing programs available through U.S. Instrument Rentals to help with both financial and acquisition requirements.

Circle (366) on Reply Card

Test instruments

Leader Instrument Corporation—12-page booklet describes eight oscilloscope models with bandwidths from 4 to 30 MHz; eight professional audio instruments including two audio system analyzers; four multimeters including digital and analog versions: 80 and 250 MHz frequency counters; three color bar generators including an NTSC model; an FM multiplex generator; LCR bridge and other general purpose instruments and accessories.

Circle (367) on Reply Card

Components

Sprague Products Company—Electronic Components Catalog C-564A covers 18 Sprague product categories and 253 Sprague component types, with more than 29,000 single product choices included. A table of contents and alpha-numeric index at the front of the 108-page book provide reference to the components for specific applications.

Circle (368) on Reply Card

Industrial catalog

Joseph Electronics—344-page industrial catalog features more than 80 product lines providing descriptions, technical specifications and pricing. It places special emphasis on test equipment, tools, PC supplies, and related products for lab and R&D markets.

Circle (369) on Reply Card

Filter catalog

TT Electronics—This filter catalog lists several million standard types. Most series types are available for frequencies from 100 Hz to 300 MHz.

Circle (370) on Reply Card

Packaging systems

ITT Cannon Electric—16-page catalog covers printed circuit and metal backpanel packaging systems. Brochure BPC-2 covers both printed circuit and metal plate backpanel packaging with 22 photographs, 19 drawings and a number of charts and graphs.

Circle (371) on Reply Card

Electronic kits

Heath Company—96-page catalog describes the latest

continued on page 222

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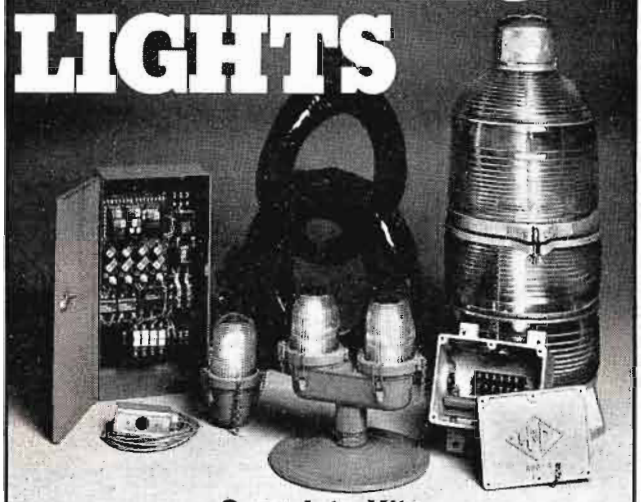

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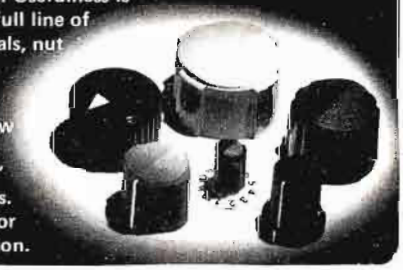

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New Literature

continued from page 121

in electronic kits. Product categories for the kitbuilder include: amateur radio, color television, high-fidelity components, test instruments, digital clocks, weather instruments, personal computer systems, auto, marine and aircraft accessories and many products for home improvement and family entertainment.

Circle (372) on Reply Card

RF power sensor models

Bird Electronic Corporation—8-page brochure lists more than a hundred typical RF power sensor models available. RF and DC output signal characteristics, connector variations, physical form and frequency ranges listed afford an overview of parameters adaptable to individual OEM design requirements.

Circle (373) on Reply Card

RFI shielded cases

COMPAC—8-page catalog describes the line of RFI shielded cases and accessories, including a variety of blank cases, standard size cases and a custom series. Accessories described include circuit boards, feed-throughs, RF connectors, test cables, adapters, coaxial terminations and attenuators.

Circle (374) on Reply Card

Microwave products

RHG Electronics Laboratory—This catalog covers the complete line of MIC microwave and IF/RF products. 104 pages contain three sections of detailed technical data on IF amplifiers, MIC mixers and mixer preamps, and microwave relay links.

Circle (375) on Reply Card

Coaxial cables

Brand-Rex Company—A brochure on coaxial cables and electrical characteristics defines the cables' technical terms and electrical characteristics. The user then can select the most economical construction with the required dimensional and electrical properties. Eight pages of data and tables include construction, UL and military listings, and information on commercial, miniature air-spaced, and irradiated coaxial cables.

Circle (376) on Reply Card

DC power supply modules

High Voltage Electronics Corporation—Specification sheet WRM678 describes the WRM line of regulated high voltage DC power supply modules. General specifications, such as input, output, polarity, regulation and ripple are noted along with individual data on 50 specific WRM models. □

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Audio-Video Engineering Co., 65 Nancy Blvd., Merrick, N. Y. 11566

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Boston Insulated Wire & Cable Co., 65 Bay St., Boston, Mass. 02125

Boston Sound & Power Systems, 3 Fredith Rd., Weymouth, Mass. 02189

Brand-Rex Co., Box 498, Willimantic, Conn. 06226

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Broadcast Automation Associates Inc., D 1,2,5,6, Box 277, Ft. Pierce, Fla. 33450

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Decca Austin Insulators, 71 Selby Road, Brampton Ont., Canada L6W 1K5

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Delta Electronics Inc. (Va.), Box 1508, Springfield, Va. 22151

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Dielectric Communications, A Unit of General Signal, Route 121, Raymond, Me. 04071

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Future Electronics Corp., 44 Fasken Dr., Unit 24, Rexdale, Ont., Canada M9W 1K5 (416) 675-7820 Rick Hawron
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NTSC Video Sales Ltd., Malton Postal Station, P.O. Box 276, Mississauga, Ont. Canada L4T 3B6 (416) 677-3332 Grayham Scott
Norlasco Film Lab, Padre Mier 837 Pte., Monterrex N.L. Mexico 42-74-44 Geo. Norlasco
PLL Video Systems, 3842 S. St. Louis, Tulsa, OK 74105 (918) 749-4192 Larry Lieberman
PSC Productions, 1754 Lisitana St., Honolulu, HI 96813 (808) 537-1251 Michel Tanaka
Planata S.A., Romero De Terreros 1007, Mexico 12 D.F. Mexico 523-9272 Alberto Algramti Y.
Roscor Corp., 6160 Oakton, Morton Grove, IL 60053 (312) 966-3010 Mr. Grossman
San Juan Electronics, 154 Ponce Deleon, Stop 3, San Juan Puerto Rico 00906 (809) 725-3342 Miguel Cabrera
Signal Engineering Inc., 720 So. 23rd St., Birmingham, AL 35202 (205) 328-6431 Louis H. Plau
Robert Sly Electronics, 3415 N. Washington Blvd., Arlington, VA 22201 (703) 525-7272 Robert Natwick
Television Engineering Co., 519 Rudder Rd., Fenton, MO 63026 (314) 343-5605 Jack Vines
Tri-Tronics Inc., 2921 W. Alameda Ave., Burbank, CA 91305 (213) 843-2170 Lyle Bailey

Industrial Marketing Advisory Services, Inc., 2425 Wilson Blvd., Arlington, Va. 22201

Stevan B. Dana, Pres. (703) 525-0400

Industrial Sciences, Box 1495, Gainesville, Fla. 32602

Innovative Television Equipment, Inc., P.O. Box 681, Woodland Hills, Cal. 91364

Inovonics, 503-B Vandell Way, Campbell, Calif. 95008

J. B. Wood, Pres. (408) 374-8300

REGIONAL SALES CONTACTS:

Taber Mfg. & Eng., 2081 Edison Ave., San Leandro, Calif. 94577 (415) 635-3831
Accurate Sound, 114 5th Ave., Redwood City, Calif. 94063 (415) 365-2843
Mel Audio/Video, 1122 E. Chevy Chase Dr., Glendale, Calif. 91205 (213) 245-7708
VIF International, 1151 Viscaino Ave., Sunnyvale, Calif. 94086 (408) 739-9740
Sound Dynamics, Box 32055, San Jose, Calif. 95152 (408) 926-3588
Savco, Box 427, Richardson, Tex. 75080 (214) 234-1841
Communications Systems, Drawer 'C', Cape Girardeau, Mo. 63701 (314) 334-6097
Inovonics, Box 1014, Port Washington, N.Y. 11050 (516) 883-4818
Joel Associates, 528 River Rd., Teaneck, N.J. 07666 (201) 836-8741
Lebow Labs, 424 Cambridge St., Allston, Mass. 02134 (617) 782-0600
Broadcast Equip. & Supply, Box 3141, Bristol, Tenn. 37620 (615) 968-7342
The Harris Co., 1779 Tiggertail Rd., Miami, Fla. 33145 (305) 854-2003
John J. Harding Ltd., 2825 Valena St., Honolulu, Hawaii 96819 (808) 841-0941
Broadcast Supply West, 2711 Locust Ave. W., Tacoma, Wash. 98466 (206) 565-2301
Track Audio, Inc., Box 24722, Seattle, Wash. 98124 (206) 941-2233

Interand Corp., Telestrator Div., 450 E. Ohio St., Chicago, Ill. 60611

International Communications, & Control Corp., Box 11749, Knoxville, Tenn. 37919

International Electro-Magnetics, 350 Eric Dr., Palatine, Ill. 60067

International Microwave Corp., 33 River Rd., Cos Cob, Conn. 06807

International Nuclear Corp., 608 Norris Ave., Nashville, Tenn. 37204

International Tapetronics Corp., Box 241, Bloomington, Ill. 61701

John Abdnour, Direct Sales Mgr. and Karen Ryder, Admin. Sales Mgr. (309) 828-1381

International Video Corp., 453 W. Maude Ave., Sunnyvale, Calif. 94086

www.americanradiohistory.com

Intertec Publishing Corp., Box 12901, Overland Park, Ks 66212

Ivie Electronics, 500 West 1200 South, Orem, Utah 84057

J

J&D International, Elec. Div., Unit E-East, Interstate Industrial Park, Bellmawr, N.J. 08031

JSH Electronics, Inc., Box 2898, Culver City, Calif. 90230

US JVC Corp., Professional Video Div., 58-75 Queens Midtown Exp., Maspeth, N.Y. 11378

Jamieson Film Co., 6901 Forest Park Rd., Dallas, Texas 75235

Janson Industries, Box 6090, Canton, Ohio 44706

Javelin Electronics, 6357 Arizona Circle, Los Angeles, Calif. 90045

Jensen Sound Laboratories, Div. of Pemcor, Inc., 4136 N. United Pkwy., Schiller Park, Ill. 60176

Jensen Tools & Alloys, D 1-9, 1230 S. Priest Dr., Tempe, Ariz. 85281

Jensen Transformers, 1617 N. Fuller Ave., Hollywood, Calif. 90046

Deane Jensen (213) 876-0059

Johnson Electronics Inc., 62 S. Hwy. 17-92, Casselberry, Fla. 32707

Joslyn Electronic Sys., Box 817, Goleta, Cal. 93017

K

K & H Products, Ltd., Box 246, North Bennington, Vt. 05257

K & L Pro Audio, D, 1, 2, 5, 6, 75 N. Beacon St., Watertown, Mass. 02172

Karen Benger (617) 926-6100

KLH Research & Development Corp., KLH Burwen Research, 145 University Ave., Westwood, Mass. 02090

KVC, Inc., 215 Lexington Ave., New York, N.Y. 10016

KVC Video Systems Inc., D 1,2, 770 Lexington Ave., New York, N. Y. 10021

Kager International, 1180 S. Beverly Dr., Los Angeles, Calif. 90035

Kahn Communications, Inc., Box 591, Freeport, N.Y. 11520

Kaitronics Corp., 1540 Gilbreth Rd., Burlingame, Calif. 94010

Paul Tarrodaychik, V.P., Mktg. (408) 739-4262

Kalart Victor Corp., Hultenius St., Plainville, Conn. 06062

Kallman Associates, Inc., 2525 Hyperion Ave., Los Angeles, Calif. 90027

Kaman Sciences Corp., 1500 Garden of the Gods Rd., Colorado Springs, Colo. 80907

Kappa Networks, Inc., 165 Roosevelt Ave., Carteret, N.J. 07008

Karex, Inc., 1262 Lawrence Station Rd., Sunnyvale, Calif. 94086

Kay Elemetrics Corp., 12 BE Maple Ave., Pine Brook, N.J. 07058

Kay Industries, Inc., 604 N. Hill St., South Bend, Ind. 46617

Kings Electronics Co., Inc., 40 Marbledale Rd., Tuckahoe, N.Y. 10707

Kliegl Bros. Lighting, 32-32 48th Ave., Long Island City, N.Y. 11101

Kline Iron & Steel Co., Box 1013, Columbia, S.C. 29202

Knox Ltd., 16021 Industrial Dr., Gaithersburg, Md. 20760

Stan Michalski (301) 840-1930

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Control Assembly Corp., 1339 Sylvandell Dr., Pittsburgh, Pa. 15243 (412) 279-2264 W. E. Carter
Radlord Associates, 3203 Lanier Dr., Atlanta, Ga. 30319 (404) 237-6097 Lew Radlord
Bruce L. Dawson & Associates, P.O. Box 115, Prospect, KY 40059 (502) 228-4898 Bruce L. Dawson
H. M. Dyer Electronics, 31185 Ten Mile Rd., Farmington Hills, Mich. 48024 (313) 478-2157 Mike Dyer
Sudduth Mfg's. Representatives, 845 39th SE, Paris, Tex. 75460 (214) 785-5764 Gene Sudduth
Omega Video, 14326 Isis Ave., Lawndale, Calif. 90260 (213) 679-9021 Rick Riegler
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Comad Communications, Ltd., 91 Kellield St., Unit 5, Rexdale, Ont. M9W 5A3 Canada (416) 245-1734 Emil Adamyk
Furrer Marketing, 4, Cour Des Bastions, CH-1205 Geneva Switzerland (022) 20-5133 George Furrer
Lerro Electrical Corp., 3125 N. Broad St., Philadelphia, PA 19132 (215) 223-8200 Richard Murphy
EME, 112 Buena Vista, High Point, NC 27260 (919) 869-3335 George Gold
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8812 Santa Fe Lane, Overland Park, KS 66212 (913) 642-2993 Jim Grunder
Mile High, 6000 E. Evans, Bldg. 3, Suite G10, Denver, CO 80222 (303) 759-5841 Chuck Jones
Video-Mon Inc., 222 Truman NE, Albuquerque, NM 87108 (505) 265-8335 Garth Simms
Systems Communications, 880 Maude Ave., Mountain View, CA 94043 (415) 967-8229 Bob Herhusky
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Sistemas Electronicas de Seguridad, 25 De Mayo 267, 1385 Buenos Aires Argentina Carlos Puleston
Telesco, 1 Dupont St., Plainview, NY 11803 (516) 433-6210 Gerald Lanier
Australian Video Engineering, 231-233 Victoria Rd., P.O. Box 248, Rydalmere NSW Australia 638-6400

Koss Corp, 4129 N. Port Washington Ave., Milwaukee, Wis. 53212

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LPB Inc., 520 Lincoln Hwy., Frazer, Pa. 19355

Harry N. Larkin (215) 644-1123

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LPB/Burden Associates, 20944 Sherman Way, Canoga Park, CA 91303 (213) 340-4590 Richard W. Burden
MSC Electronics, Ltd., 254 Wildcat Rd., Downsview, Ont. Canada M3J 2N5 (416) 661-4180

L-W International, 6416 Variel Ave., Woodland Hills, Calif. 91367

Pat Smith (213) 348-8614

Laird Telemedia Inc., 2125 S.W. Temple, Salt Lake City, Utah 84115

Lampkin Lab. Inc., Box 9048, Bradenton, Fla. 33506

Landy Associates Inc., D 1,2, 1890 East Marlton Pike, Cherry Hill, N.J. 08003

Rus Lang Corp., 247 Ash St., Bridgeport, Conn. 06605

Frank Ruskay, Jr. (203) 384-1266

James B. Lansing Sound, Inc., 8500 Balboa Blvd., Northridge, Calif. 91329

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JBL, 1413 Leicester St., Garland, TX 75042 (214) 495-5415 Carl Cathcart

D. N. Latus & Co., Inc., Box 1720, Helena, Mont. 59601

Lauderdale Electronic Labs, D 1-9, 16 S.W. 13th St., Fort Lauderdale, Fla. 33315

Lawhed, Ltd., 388 Reed Rd., Broomall, Pa. 19008

Leader Instruments Corp., 151 Du-Pont St., Plainview, N.Y. 11803

Lectronic Research Laboratories, Inc., D 1-9, Atlantic & Ferry Avenues, Camden, N.J. 08104

Lectrotech Inc., 5810 N. Western Ave., Chicago, Ill. 60659

Lee-Ray Industries, Inc., 38 E. First Ave., Mesa, Ariz. 85202

Leitch Video Ltd., 705 Progress, Unit 46, Scarborough, Ont., Canada M1H 2X1

J. Walter (416) 438-5060

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D. A. Hill Enterprise, Box 2140, Scottsdale, Ariz. 85252 (602) 948-1075 David Hill
Didier/Denver, Box 1599, Evergreen, Colo. 80439 (303) 674-6000 Herb Didier
Wiltronix Inc., 5504 Waterway, Rockville, Md., 20853 (301) 460-1454 Dwight L. Wilcox
Nortec West Ltd., 7056 B Farrell Rd. S.E., Calgary, Alta. T2H 0T2 Canada (403) 252-8141 Ron Hill
Nortec West Ltd., 325 West 5th Ave., Vancouver, B.C. V5Y 1J6 Canada (604) 872-8525 R. Whitehouse
Broadcast Video Systems Ltd., 1050 McNicoll Ave. E., Unit 15, Agincourt, Ont. M1W 2L8 Canada (416) 497-1020 Bert Verwey

Lenco Inc., Electronics Div., 300 N. Maryland St., Jackson, Mo. 63755

Richard N. Lawrence (314) 243-3147

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Lenco, Inc., Midwest, P.O. Box 301, Atchison, KS 66002 (913) 367-1146 Merton L. Knold
Lenco, Inc., Northeast, 1 Elmwood Lane, Westport, CT 06880 (203) 226-4482 Robert N. Henson
Lenco, Inc., Southeast, 2390 Tiffany Circle, Decatur, GA 30035 (404) 288-2080 Arie H. Lawdrum Jr.

Lenzar Optics Corp., 210 Brant Rd., Lake Park, Fla. 33403

C. M. Levit Electronics, D 1-9, 200 Park Ave. S., New York, N.Y. 10003

Lightning Elimination Assoc., Inc., 12412 Benedict Ave., Downey, Calif. 90242

Lipps Inc., 1630 Euclid St., Santa Monica, Cal. 90404

Lipsner-Smith Corp., 4700 Chase St., Lincolnwood, Ill. 60646

Listec TV Equip. Corp., 39 Cain Dr., Plainview, N.Y. 11803

Bruce I. Ballantyne (516) 694-8963

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Marvin B. Jacobs Television Optics, 4527 San Fernando Rd., Unit 1, Glendale, CA 91204 (213) 244-0838 Marvin Jacobs or Howard Stucker
Klopl Audio/Video Co., 3381 Successful Way, Dayton, OH 45414 (513) 236-5500 Bob Johnson
Lykes Electronics Corp., 5426 W. Crenshaw St., Tampa, FL 33622 (813) 886-6621 Carlo McDaniel
M.P.C.S. Video Center, 514 W. 57th St., New York, NY 10019 (212) 586-3690 Henry Bornstein
Midwest Telecommunications, 15046 Bellway Dr., Dallas, TX 75240 (214) 387-2755 Jack Wood
Peirce-Phelps, Inc., 2000 N. 59th St., Philadelphia, PA 19131 (215) 879-7000 Peter Lambert
Radlord Associates, 3203 Lanier Dr., Atlanta, 11 30319 (404) 237-6097 Lew Radlord
Roscor Corp., 6160 W. Oakton St., Morton Grove, IL 60053 (312) 539-7700 Steve Deitch
SAVCO, P.O. Box 427, Richardson, TX 75080 (214) 234-1841 Nathan Hughes
Technical Video Systems, 245 Executive Park Blvd., Winston-Salem, NC 27103 (919) 768-9536 James E. Holladay
Video Images, 12200 W. Adler Lane, West Allis, WI 53214 (414) 475-0111 Tom Garalalo
Video Systems, Inc., 2000A Governors Circle, Houston, TX 77092 (713) 686-9651 Mack McConathy

Lita Broadcasting Distributors, D 1-9, Box 440752, Miami, Fla. 33144

Logitek Electronic Systems, Box 25304, Houston, Texas 77005

L. Scott Hochberg and Eric M. Sisson (713) 523-7878

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108 Hillsboro, Greenfield, TN 38230 (901) 235-2943; 2201 R.W. 'Mo Mo' Moseley
Southwest Distributors, 13201 S. Windward Trail, Orland Park, IL 60462 (312) 448-4929

The London Co., 811 Sharon Drive, Cleveland, Ohio 44145

Lowel-Light, 421 W. 54th St., New York, N.Y. 10019

Lumitrol, Ltd., D-Canada, 400 Don Park Rd. (Unit 23), Markham, Ont., Canada L3R 1C6

M

MCI, Inc., 4007 N.E. 6th Ave., Ft. Lauderdale, Fla. 33334

MCG Electronics Inc., 160 Brook Ave., Deer Park, N.Y. 11729

MICMIX Audio Products, Inc., 2995 Ladybird Lane, Dallas, Texas 75220

MPB Technologies Inc., P.O. Box 160, Ste-Anne-de-Bellevue, Que., Canada H9X 3L5

MacKenzie Laboratories, Inc., 5507 N. Peck Road, Arcadia, Calif. 91006

Magnasync/Moviola Corp., 5539 Riverton Ave., North Hollywood, Calif. 91601

Magna-Tech Electronic Co., Inc., 630 Ninth Ave., New York, N.Y. 10036

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Magnecraft Electric Co., 5575 N. Lynch Ave., Chicago, Ill. 60630

P. R. Mallory & Co. Inc., Box 1284, Indianapolis, Ind. 46201

Marconi Communication Systems Ltd., Marconi House, Chemsford, Essex, England CM1 1PL

Marconi Electronics Inc., 100 Stonehurst Ct., Northvale, N. J. 07647

Fred Bones (201) 767-7250

Marconi Instruments, Div. of Marconi Electronics Inc., 100 Stonehurst Ct., Northvale, N. J. 07647

Keith Elkins, Tony Ramsden (201) 767-7250

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S&S Associates, 4924 Hampden Lane, Bethesda, Md. 20014 (301) 654-1434 Bill Becker
Kenneth W. Meyers Co., 1242 Remington Rd., Schaunburg, Ill. 60195 (312) 882-4808 Ken Meyers
Ken Corp., 38 Montvale, Stoneham, Mass. 02180 (617) 438-5464 Sam Kenton
Lee Associates, 817 Wheeler Ave., Huntsville, Ala. 35801 (205) 533-5896 Steve Shelley
TASCO, 606 110th Ave. N.E., Suite 204, Belleview, Wash. 98004 (206) 453-1414 Helbert Bartels
BRADENCO, 11500 Stemmons Freeway, Suite 113, Dallas, Tex. 75229 (214) 243-7261 Bob Braden
Moxon Electronics, 1440 S. State College Blvd., Anaheim, Calif. 92806 (714) 635-7600 Jim Jordan
John Robinson, 817 Fifth St., Santa Monica, Calif. 90403 (213) 451-9019 John Ro
Measurement Consultants, Inc., Box 966, Scottsdale, Ariz. 85252 (602) 994-9519 Dave Memegay
PAC, 11920 Grandview Rd., Grandview, Mo. 64030 (816) 763-4155 Daryl Booth

Marti Electronics, Box 661, Cleburne, Tex. 76031

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Dyma Engineering, Route 1, Box 51, Taos, NM 87571 (505) 235-8930 Carol Cunningham
Electronics Industries, 19 E. Irving, Oshkosh, WI 54901 (414) 235-8930 Bud Tedley
Guarantee Radio Supply, 1314 Iturbide St., Laredo, TX 78040 (512) 723-6913 Manuel Flores
McMartin Industries, 4500 S. 76th St., Omaha, NE 68127 (402) 331-2000 Bill Swanson
RCA, Bldg. B-10, Front & Cooper Sts., Camden, NJ 08102 (609) 963-8000 W.W. Warren
Singer Products, One World Trade Center, Suite 2365, New York, NY 10048 (212) 432-1400 John Hullman

Martin Audio Video, D2, 423 W. 55th St., New York, N.Y. 10019

Mastertone Co., Inc., D 4, 228 Fifth St., West Des Moines, Iowa 50265

Maury Microwave Corp., 8610 Helms Ave., Cucamonga, Calif. 91730

Maxell Corp. of America, 60 Oxford Dr., Moonachie, N. J. 07074

Maze Corp, D6, Box 6636, Birmingham, Ala. 35210

McCurdy Radio Ind. Inc., 1711 Carmen Dr, Elk Grove Village, Ill. 60007

Ron Mitchell, Ralph Gould (312) 640-7077

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McCurdy Radio, 108 Carnforth Rd., Toronto, Ont. M4A 2L4 Canada (416) 751-6262 Stan Maruno

McKay Dymek Co., Box 5000, Claremont, Calif. 91711

Renae Goertz, Sales Coordinator (800) 472-1783 Outside CA: (800) 854-7769

McMartin Industries, Inc., 4500 South 76th St., Omaha, Neb. 68127

Media Concepts, Inc., D 1-9, Box 10745, St. Petersburg, Fla. 33733

Memorex Corp., Professional Products Group, 1200 Memorex Drive, Santa Clara, Cal. 95052

Merlin Engineering Works, Inc., 1880 Embarcadero, Palo Alto, Calif. 94303

Merill Cable Equipment Corp., Box 13741, Phoenix, Ariz. 85002

Micro Communications, Inc., Grenier Field, Box 4365, Manchester, N.H. 03108

Howard Bouldry (603) 624-4351

Micro Consultants, Box 10057, Palo Alto, Calif. 94303

Micro Control Associates, Inc., Box 13250, Arlington, Texas 76013

Robert E. Richards (817) 265-2912, 261-4889

Microdyne Corp., Box 1527, Rockville, Md. 20850

Micro TV, Inc., 3600 Conshohocken Ave., Philadelphia, Penn. 19131

Microtime, Inc., 1280 Blue Hills Ave., Bloomfield, Conn. 06002

Daniel J. Solie (203) 242-0761

REGIONAL SALES CONTACTS:

Microtime, Inc., Southeast Region, 9771 N.W. 24th Court, Sunrise, Fla. 33322 (305) 741-9191 Philip M. Dubs, Sales Mgr.
Microtime, Inc., Broadcast & Canada Sales Div., 1280 Blue Hills Ave., Bloomfield, Conn. 06002 (203) 242-0761 Richard H. McLean, Mgr.
Microtime, Inc., International Sales Div., 1280 Blue Hills Ave., Bloomfield, Ct. 06002 (203) 242-0761 Neal Owens, Jr., Sales Mgr.
Microtime, Inc., Central Region, 6317 Aldrich Ave. S., Minneapolis, Minn. 55423 (612) 861-6228 William E. Baird, Sales Mgr.
Microtime, Inc., West Coast Region, 2351 Daphne Place, Fullerton, CA 92633 (714) 992-4332 Richard E. Lyons

Micro-Trak Corp., 620 Race St., Holyoke, Mass. 01040

Microtran Co., Inc., Box 236, Valley Stream, N.Y. 11582

Microwave Assoc. Inc., South Ave., NW Industrial Prk., Burlington, Mass. 01803

Midwest Corp., Tele Communications Div., 3331 N.W. 82nd Ave., Miami, Fla. 33122

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Midwest Telecommunications, 1804 Cargo Court, Louisville, KY 40299 (502) 491-2888 Jerry Willingham
Midwest Telecommunications, 4937 Harlord Ave., Beltsville, MD 10705 (301) 937-1890 Welby Smith, Mgr.
Midwest Telecommunications, 1150C W. 8th St., Cincinnati, OH 45203 (513) 651-1904 Dave Barnes, Mgr.
Midwest Telecommunications, 15046 Beltway Dr., Dallas, TX 75240 (214) 387-2755 Jack Wood, Mgr.
Midwest Telecommunications, 5200 Mitchelldale, Suite F28, Houston, TX 77092 (713) 686-9278 George Bates, Mgr.
Midwest Telecommunications, 1395 Air Rail Ave., Virginia Beach, VA 23455 (804) 464-6256 Kevin Zmarthie, Mgr.

Miles Associates, Div. Miles Products Ltd., 240 Birmingham St., Toronto, Ont., Canada M8V 2C8

Millard Metal Service Center, Inc., Box 'O', Braintree, Mass. 02184

Miller-Stephenson Chemical Co., Inc., George Washington Hwy., Danbury, Conn. 06810

Mineroff Electronics, D 1,2,3,5,6, 946 Downing Rd., Valley Stream, N.Y. 11580

Minneapolis Magnetics, Inc., 8125 Pleasant Ave. S., Minneapolis, Minn. 55420

Modular Audio Products, Unit of Modular Devices, Inc., 50 Orville Dr., Bohemia, N. Y. 11716

Monroe Electronics, Inc., 100 Housel Ave., Lyndonville, N.Y. 14098

Charles Moore, Box 2023, Rocky Mount, N.C. 27801

Moseley Associates, Inc., 111 Castilian Drive, Goleta, Cal. 93017

Mark G. Fehlig (805) 968-9621

Motorola, Communications and Electronics Inc., 1301 E. Algonquin Rd., Schaumburg, Ill. 60196

Motorola SPI, Box 20912, Phoenix, Ariz. 85036

Mountain West Alarm, D8, Box 10780, Phoenix, Ariz. 85064

Mu-Del Electronics, Inc., 2426 Linden Lane, Silver Spring, Md. 20910

Multronics, Inc., 9005 Red Branch Rd., Columbia, Md. 21045

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NEC America, Inc., Broadcasting Equip. Div., 130 Martin Lane, Elk Grove Village, Ill. 60007

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Video Systems, 2123 West Governors Circle, Houston, 44 77092 (713) 686-9651 Ralph Moore
NEC America, Eastern, 12 Lido Lane, Bedford, MA 01730 (617) 275-0396 Robert Curwin
Alpha Video & Electronics, Inc., 8 East Mall Plaza, Carnegie, PA 15106 (412) 279-6169 Henry Lassiage
Applied Electronics Ltd., 299 Evans Ave., Toronto, Ont. Canada M8Z 1K2 (416) 252-3761 Mike Steckly
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Nagra Magnetic Recorders, Inc., 19 W. 44th St., Room 715, New York, N.Y. 10036

Nagy Research Products, Box 289, McLean, Va. 22101

The Narda Microwave Corporation, 75 Commercial St., Plainview, N.Y. 11803

National Electrolab Ltd., 1536 Columbia St., North Vancouver, BC, Canada V7J 1A4

Terry C. Gould (604) 985-0511

Neumade Products Corp., 720 White Plains Rd., Scarsdale, N.Y. 10583

Neutrik, 91 McKee Dr., Mahwah, N.J. 07430

Rupert Neve, Inc., Berkshire Industrial Park, (203) 744-6230, Conn. 06801

Newark Electronics, D 1-9, 500 N. Pulaski Rd., Chicago, Ill. 60624

North American Radio Corp., 1300 E. Arapaho Rd. #203, Richardson, Tex. 75081

North Hills Electronics, Inc., Alexander Pl., Glen Cove, N.Y. 11542

North Wind Power Co., Box 315, Warren, Vt. 05674

Norton Associates Inc., 10 Ditomas Court, Copaigue, N.Y. 11726

Nortronics Co., Inc., 8101 Tenth Ave. N., Minneapolis, Minn. 55427

Nova Corp., Box 2121, Canoga Park, Calif. 91306

Fred A. Nudd Corp., Box 1743 Rt. 104, Ontario, N. Y. 14519

Rick Nudd (315) 524-2521

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Radford Associates, 1331 Otter Creek Rd., Nashville, Tenn. 37215 (615) 373-0231 Ralph L. Hucaby
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RIA Corp., P.O. Box 1670, Cottonwood, AZ 86326 (602) 634-8065 Jack Daniels
Radford Associates, 3203 Lanier Dr., Atlanta, GA 30319 (404) 237-6097 Lew Radford

O

Oak Industries, Inc., Crystal Lake, Ill. 60014

O'Connor Eng. Labs. Inc., 100 Kalmus Drive, Costa Mesa, Calif. 92626

K. Ferrell Forehand (714) 979-3993

Walter Odemer Co., D 4,5,6,7,8,9, 1516 W. Magnolia Blvd., Burbank, Calif. 91506

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Oktel Corp., 490 Division St., Campbell, Calif. 95008

Oldham Tower Systems, 48 Bayou Dr., Indianola, Miss. 38751

Olesen, D 1-9, 1535 Ivar Ave., Hollywood, Calif. 90028

Onan, 1400 73rd Avenue NE, Minneapolis, Minn. 55432

Opamp Labs, Inc., 1033 N. Sycamore Ave., Los Angeles, Calif. 90038

B. Losmandy (213) 934-3566

Optek, 5526 E. La Palma Ave., Anaheim, Calif. 92807

Optima Enclosures, 2166 Mountain Industrial Blvd., Tucker, Ga. 30084

Orange County Electronics Int'l., Inc., 534 Berry St., Winnipeg, Man., Canada R3H 0R9

Orban Assoc. Inc., 645 Bryant St., San Francisco, Calif. 94107

Frank Santucci, Mktg. Mgr. (415) 957-1067

Oregon Magnetics, Box 13374, Portland, Ore. 97213

Oregon Sound & Lights, D 8,9, 1856 East 13th Ave., Eugene, Ore. 97403

Osawa & Co. (USA), Inc., 521 Fifth Ave., New York, N.Y. 10017

Otari Corp., 981 Industrial Rd., San Carlos, Calif. 94070

Lew Barrett (415) 593-1648

P

PSI Paperwork Systems, Inc., Box 38, Bellingham, Wash. 98225

PWH Electronics, Box 435, Toronto, Ont. Canada M6H 4E3

Pacific Recorders and Engrg. Corp., 11100 Roselle St., San Diego, Calif. 92121

Jack Williams (714) 453-3255

Packaged Lighting Systems, Box 285 Grant St., Walden, N.Y. 12586

Hy and Lillian Hilzer (914) 778-3515

Panasonic Company, One Panasonic Way, Secaucus, N.J. 07094

Panasonic Video Systems Div., Box 1501, Secaucus, N.J. 07094

Alvin Barshop (201) 348-7683

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Panasonic Video Systems Div., Southeast Area, #2 Meca Way, Duluth, Ga. 30136 (404) 448-5683 Leroy Wright, Regional Mgr.
Panasonic Video Systems Div., Midwest Area, 1098 Greenleaf Ave., Elk Grove Village, Ill. 60007 (312) 539-0710 Gary Olson, Regional Mgr.
Panasonic Video Systems Div., Southwest Area, 1825 Walnut Hill Lane, Irving, Tex. 75062 (214) 256-1388 Terry Conner, Regional Mgr.

Paperwork Systems, Box 38, Bellingham, Wash. 98225

Paso Sound Products Inc., 14 First St., Pelham, N.Y. 10803

Peirce-Phelps, Inc., Video Systems Div. D 2,5, 2000 N. 59th St., Philadelphia, Pa. 19131

Pentagon Industries, Inc., 4751 N. Olcott Ave., Chicago, Ill. 60656

Phelps Dodge Communications Co., Rt. 79, Marlboro, N.J. 07746

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Breit Tower Service, Dinner Key Marina, Miami, Fla. 33132 (305) 858-3143 Charles E. Breit
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Taurus Industries, 188 South Blvd., Baton Rouge, La. 70808 (504) 383-9955 Dale Pearson
M.S.E. Engineering Systems, Ltd., 265 Canartic Dr., Downsview, Ont. M3J 2N7 Canada (416) 661-5646 Al Egerton

Philips Broadcast Equip Corp., 91 McKee Dr., Mahway, N. J. 07430

William E. Amos, V.P. Mktg. (201) 529-3800

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Philips Broadcast Equip. Corp., 15611 Fishport Rd., Prior Lake, MN 55372 (612) 447-6036 Jeffrey Clarine
Philips Broadcast Equip. Corp., Central Region, 801 Branding Iron S.E., Albuquerque, N.M. 87123 (505) 299-0583 Chuck Buzzard
Philips Broadcast Equip. Corp., Central Region, Norelco House, 7530 Frontage Rd., Skokie, Ill. 60076 (312) 679-8600 Harry Gladwin
Philips Broadcast Equip. Corp., Northwestern Region, 3760 Cahuenga Blvd., North Hollywood, Calif. 91604 (213) 766-8185 Jerry Kraus and Michael Hartt
Philips Broadcast Equip. Corp., Southwestern Region, 412 Roy Court, Keller, Tex. 76248 (817) 379-5484 Richard Bock

Philips Test & Measuring Instruments, Inc., 85 McKee Dr., Mahwah, N. J. 07430

Photo Research, Div. of Kollmorgen Corp., 3000 N. Hollywood Way, Burbank, Cal. 91505

Pinzone Communications Products Inc., 10142 Fairmount Rd., Newbury, Ohio 44065

Basil Pinzone, Jr. (304) 296-4493

Pleasantville Labs, Box 15068, Baltimore, Md. 21208

Potomac Instruments, Inc., 932 Philadelphia Ave., Silver Spring, Md. 20910

David G. Harry (301) 589-8662

Power-Optics Inc., 1055 W. Germantown Pike, Fairview Village, Pa. 19409

Pro-Audio Specialties Co., 1291 Rand Rd., Des Plaines, Ill. 60016

Jerry Weyrich (312) 827-8388

Prodelin Inc., Box 131, Hightstown, N.J. 08520

Professional Audio Service, D 1-9, Box 1953, Fort Worth, Texas 76101

Jeanie Sims (817) 536-6254

Progressive Marketing, D 1-9, 75 Mt. Herman Rd., Scotts Valley, Calif. 95066

Pulse Dynamics Mfg. Corp., (PDMC), Box 355, Colchester, Ill. 62326

Pulse Techniques Inc., 1411 Palisade Ave., Teaneck, N.J. 07666

E. R. Shenk (201) 837-2575

Q

QEI Corp., Rt. 73, Kresson, N. J. 08053

QRK Electronic Products, 1568 N. Sierra Vista, Fresno, Calif. 93703

QSI Systems, Inc., D 1, 993 Watertown St., West Newton, Mass. 02165

Q-TV, 33 West 60th St., New York, N.Y. 10023

Quad-Eight Electronics, 11929 Vose St., North Hollywood, Calif. 91605

Quantum Audio Labs, Inc., 1905 Riverside Dr., Glendale, Calif. 91201

John Pritchett, Pres. (213) 841-0970

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Sound Genesis, Inc., 2001 Bryant St., San Francisco, CA 94110 (415) 285-8900 Bob Ulias

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RCA Broadcast Systems, Front and Cooper Streets, Camden, N.J. 08102

RCA Cablevision Systems, 7355 Fulton Ave., North Hollywood, Calif. 91605

RCA Distributor & Special Products Div., 2000 Clements Bridge Rd., Deptford, N.J. 08096

RCA Electro Optics and Devices, New Holland Ave., Lancaster, Pa. 17604

RCA Power Tube Marketing, Lancaster, Pa. 17604

RCA Solid State Div., Rt. 202, Somerville, N.J. 08876

RF Systems, Inc., 155 King St., Cohasset, Mass. 02025

ROH Corporation, 107 Technology Park, Norcross, Ga. 30092

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Sound Solutions, 2971 E. 14 Mile Rd., Sterling Hgts., MI 48077 (313) 979-6320 Dave Hill
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Doug Leighton (213) 980-0511

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Jules Racine & Co., Inc., 85 Executive Blvd., Elmsford, N.Y. 10523

Radiation Devices Co., Inc., Box 8450, Baltimore, Md. 21234

Ram Audio Systems, Inc., 17 Jansen St., Danbury, Conn. 06810

Ramko Research Inc., 11355 'A' Folsom Blvd., Rancho Cordova, Calif. 95670

Jack M. Ducart (916) 635-3600

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Champagne Sales Co., 3645 Crooks Rd., Troy, MI 48084 (313) 649-4428 Bob Champagne
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Oakwood Audio Labs, 10874 97th St., Edmonton, Alta Canada T5H 2M5 (403) 424-2186
Oakwood Audio Labs, 12-1638 Pandosy St., Kelowna, B.C. Canada V1Y 1P5 (604) 763-5222
M.Z.B. & Associates, 3701 Kirby, Suite 834, Houston, TX 77097
M.Z.B. & Associates, P.O. Box 401905, Dallas, TX 75240 (214) 233-5535 Darryl Parker
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Rapid-Q, Edco Products, Inc., 680 Bizzell Dr., Lexington, Ky. 40504

Raven Screen Corp., 124 East 124th St., New York, N.Y. 10035

Recording Supply Co., 1233 Rand Rd., Des Plaines, Ill. 60616

Ray Kaiser (213) 297-0955

Recortec Inc., 777 Palomar Ave., Sunnyvale, Calif. 94086

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Research Technology, Inc., 4700 Chase, Lincolnwood, Ill. 60646

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Reynolds/Leteron Co., 13425 Wyandotte St., North Hollywood, Calif. 91605

Rhoades National Corp., Box 817, Hendersonville, Tenn. 37075

Richmond Hill Laboratories Ltd., 1240 Ellesmere Rd., Scarborough, Ont., Canada M1P 2X4

Richmond Sound Design, Ltd., 1234 W. 6th Ave., Vancouver, B.C., Canada V6H 1A5

Rivers Associates, Inc., Box 58, Leominster, Mass. 01453

Robins Broadcast & Sound Equip. Corp., 75 Austin Blvd., Commack, N. Y. 11725

Rodelco Corp., 356 A Comac Road, Deer Park, N.Y. 11729

Rohde & Schwarz Sales Co., 14 Gloria Lane, Fairfield, N.J. 07006

Roll-A-Reel, 7881 Reading Rd., Cincinnati, Ohio 45237

Roscor Corp., D3, 4, 6160 Oakton, Morton Grove, Ill. 60053

Ross Video Ltd., 9 Iroquois Plaza, Iroquois, Ont., Canada K0E 1K0

Russco Electronics Mfg. Inc., 5690 E. Shields, Fresno, Calif. 93727

Russell C. Friend, Barbara Davis (209) 291-5591

Rust Corp., Box 273, Everett, Mass. 02149

Rycom Instruments, 9351 E. 59th St., Raytown, Mo. 64133

S

SC Electronics, Inc., 530 Fifth Ave., N.W., St. Paul, Minn. 55112

SGL Waber Electric, 300 Harvard Ave., Westville, N. J. 08093

SPI-ITT, Metrix Instruments Div., P.O. Box 30, 74010 Annecy, France

SSAC Inc., Box 395, Liverpool, N.Y. 13088

David Lawrie (315) 622-1000

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Communications Facilities, P.O. Box 98, Lexington Park, MN 20653 (301) 862-1777 Samuel Leach
Lauderdale Electric Labs, 16 S.W. 13th St., Ft. Lauderdale, FL 33315 (305) 764-7755 Irene Linne
U.S. Tower Service, 677 S. Lawn Lane, Rockville, MD 20850 Norm Jeweler

SWR Inc., Box 215, Goffstown, N.H. 03045

Jack Kruger (603) 497-3000

Sadelco, Inc., 299 Park Ave., Weehawken, N. J. 07087

Saki Magnetics, Inc., 1649 - 12th St., Santa Monica, Calif. 90404

Howard W. Sams & Co., Inc., 4300 West 62nd St., Indianapolis, Ind. 46268

Sansui Electronics Corp., 55-11 Queens Blvd., Woodside, N. Y. 11377

Satin by Osawa, 521 Fifth Ave., New York, N.Y. 10017

Saxton Products Inc., 215 N. Route 303, Congers, N.Y. 10920

Scala Radio Corp., 1970 Republic Ave., San Leandro, Cal. 94577

The Ken Schaffer Group, Inc., 10 East 49th St., New York, N.Y. 10017

Michael Stone (212) 371-2335

Schneider Corp. of America, 185 Willis Ave., Mineola, N. Y. 11501

Jos. Schneider GmbH & Co., P.O. Box 947, D-6550 Bad Kreuznach, West Germany

Scientific-Atlanta, Inc., 3845 Pleasantdale Rd., Atlanta, Ga. 30340

Scientific Radio Systems, Inc., 367 Orchard St., Rochester, N.Y. 14606

Neal E. Garman (716) 458-3733

Scientific Systems, Inc., 5 Donsen Lane, Scotch Plains, N.J. 07076

Scully Recording Instruments, Div. of Dictaphone Corp., 475 Ellis St., Mountain View, Calif. 94040

Homer Hull (415) 968-8389

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Scully Recording Instruments, 1005 8th Ave. S., Nashville, Tenn. 37203 (615) 244-1546 Bill Shute
Scully Recording Instruments, 3434 W. Peterson Ave., Chicago, Ill. 60645 (312) 583-7878 Gareth Nelson
Scully Recording Instruments, 548 Kingsley Dr., Los Angeles, Calif. 90020 (213) 380-7980 Phil Flad

Sencore Inc., 3200 Sencore Drive, Sioux Falls, S. D. 57107

Sennheiser Electronic, 10 West 37th St., New York, N. Y. 10018

Shallco, Inc., Hwy. 301 South, P.O. Box 1089, Smithfield, N.C. 27577

M. D. Sutton (919) 934-3135

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Harvey Electronics, 60 Crossways Park, Woodbury, NY 11797 (516) 921-8700 John Fariello
Philadelphia Electronics, 112 N. 12th St., Philadelphia, PA 19107 (215) 568-3001 David C. Shaw
Southeast Electronics, 1125 Rosselle St., Jacksonville, FL 32203 (904) 356-3007 H. Clark Overton
United Radio, Inc., Summit Rd. & Reinhold Dr., Cincinnati, OH 45237 (513) 761-4030 Russ Kufer
Wholesale Electronics, 2809 Ross Ave., Dallas, TX 75201 (214) 824-3001

Sharp Electronics Corp., 10 Keystone Place, Paramus, N.J. 07652

Shintron Co. Inc., 144 Rogers St., Cambridge, Mass. 02142

Eckhard Konkel, Peter Choi (617) 491-8700

Shively Laboratories, Inc., Route 302, Raymond, Me. 04071

Shure Brothers Inc., 222 Hartrey Ave., Evanston, Ill. 60204

Siegel Electronics, Box 66, Ft. Hamilton Station, Brooklyn, N.Y. 11209

Sigma Electronics, Inc., 1830 State St., East Petersburg, Pa. 17520

Signal Transformer Co., 500 Bayview Avenue, Inwood, N.Y. 11696

Sinai-Johnson, D 8,9, Box 5218, Redwood City, Calif. 94063

Singer Products Co., Inc., One World Trade Center Suite 2365, New York, N.Y. 10048

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Sitco Antenna Co., Box 20456, Portland, Ore. 97220

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Robert Benson (212) 274-7222

Skotel Corp., 1445 Provencher, Brossard, Que. Canada J4W 1Z3

Stephen Scott (514) 676-1813

Eric Small & Associates, 680 Beach St., Suite 365, San Francisco, Calif. 94109

Warren R. Smith Co., 8-09 Fern St., Fairlawn, N.J. 07410

Solar Power Corp., 20 Cabot Rd., Woburn, Mass. 01801

Soll, 401 East 74th St., New York, N.Y., 10021

Sono-Mag Corp., 1005 W. Washington St., Bloomington, Ill. 61701

Sony Corp. of America, VTR Div., 9 W. 57th St., New York, N.Y. 10019

Phil Stack, Video Products (212) 371-5800

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Sound Genesis, D 8,9, 2001 Bryant St., San Francisco, Calif. 94110

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Charles Lucas Sales Co., Box 24632, Dallas, Tex. 75224 (214) 330-8181 Charles Lucas
Maish Sales, 500 Madison St., Box 186, Mulberry, Ind. 46058 (317) 296-2322 Charles Maish
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Partridge Electronic Sales, Box 21205, Salt Lake City, Utah 84121 (801) 272-3131 Clark Partridge
Elmark Co., 2559 Huntingdon Pike, Huntingdon Valley, Pa. 19006 (215) 947-0750 Mark Pitkow
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T. R. Moore & Assoc., 8513 Springboro Pike, Miamisburg, OH 45342 (513) 433-0762 Bob Moore
The Irving W. Rose Group, 8137 Ridgeway Ave., Skokie, Ill. 60076 (312) 674-6790 Irving Rose
Shea Sales, 552 Prospect St., Maplewood, N.J. 07070 (201) 762-2382 Tom Shea

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Spectra Sonics, 3750 Airport Rd., Ogden, Utah 84403

Spectra-Vision Corp., 1528 Belfield Ave., Philadelphia, Pa. 19141

Sphere Electronics, 20201A Prairie, Chatsworth, Calif. 91311

Spindler & Sauppe, Inc., 13034 Saticoy St., North Hollywood, Cal. 91605

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Standard Tape Laboratory, Inc., 26120 Eden Landing Rd. #5, Hayward, Calif. 94545

Frank Lennert (415) 786-3546

Stanton Magnetics Inc., Terminal Drive, Plainview, N.Y. 11803

Pete Bidwell, Prod. Prod. Mgr. (516) 681-0200

Stantron Div., 6914 Beck Ave., North Hollywood, Calif. 91605

Storeel Corp., 4993 New Peachtree Rd., Atlanta, Ga. 30341

Ruth E. Schaeffer (404) 458-3280

Strand Century, Inc., 20 Bushes Lane, Elmwood Park, N. J. 07407

Studer Revox America, 1819 Broadway, Nashville, Tenn. 37203

Raymond M. Updike (615) 329-9576

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Studio Electronics, D 3,4,7, 3252 West Foster, Chicago, Ill. 60625

Studio Tape Exchange, D 2,9, 630 9th Ave., 8th Floor, New York, N.Y. 10036

Suda Seisakusho Co., Ltd., Nitsuko-Bldg., 6-14-13,Ginza, Chuo-ku, Tokyo, Japan 104

Super8 Sound, Inc., 95 Harvey St., Cambridge, Mass. 02140

Superex Electronics Corp., 151 Ludlow St., Yonkers, N.Y. 10705

Superscope, Inc., 20525 Nordhoff St., Chatsworth, Calif. 91311

Surcom Associates, 305 Wisconsin Ave., Oceanside, Calif. 92054

August J. Link (714) 722-6162

Swager Tower Corp., Box 656, Fremont, Ind. 46737

Switchcraft Inc., 5555 N. Elston Ave., Chicago, Ill. 60630

Gerry Mills (312) 792-2700

System Associates, 6117 Reseda Blvd., Ste. 205, Reseda, Calif. 91335

Walter A. Shubin & Billy Seidel (213) 344-3552

System Concepts Inc., 395 Ironwood Dr., Salt Lake City, Utah 84115

Systron-Donner, 10 Systron Dr., Concord, Calif. 94518

T

TDK Electronics Corp., 755 Eastgate Blvd., Garden City, N. Y. 11530

Bud Barger (516) 746-0880

TEAC Corp of America, 7733 Telegraph Rd., Montebello, Cal. 90640

TM Systems, Inc., 25 Allen St., Bridgeport, Conn. 06604

TSC Development Labs., 2217 Purdue Ave., Los Angeles, Calif. 90064

TT Electronics, Inc., 2214 S. Barry Ave., Los Angeles, Calif. 90064

S. J. Sodaro (213) 478-8224

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Taber Mfg. & Engr. Co., 2081 Edison Ave., San Leandro, Cal. 94577

Robert H. Kearns, Mkt. Mgr. (415) 635-3831

Tandberg of America, Inc., Labriola Court, Armonk, N. Y. 10504

Tangent Systems, Inc., 2810 S. 24th St., Phoenix, Ariz. 85034

Tape City, Inc., 404 Park Avenue South, New York, N. Y. 10016

Tape-Athon Corp., Box 814, Inglewood, Cal. 90301

Tayburn Electronics, Inc., 6106 Avenida Encinas, Carlsbad, Calif. 92008

Taylor Instrument, Consumer Prod. Div. Sybron Corp., Arden, N.C. 28704

Tech Laboratories Inc., Bergen & Edsall Blvds., Palisades Park, N.J. 07650

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Spectrum Assoc., 1823 E. 17th St., Santa Ana, Calif. 92701 (213) 323-0603
Inverness Mktg., 14 Inverness Dr. E., Englewood, Colo. 80110 (303) 770-2300
NBS Assoc., Main St., New Preston, Conn. 06777 (203) 868-0501
Reynolds & Assoc., 476 N. A1A, Satellite Beach, Fla. 32937 (305) 773-4700
Grady Duckett Sales, Box 29067, Atlanta, Ga. 30358 (404) 451-3529
Crimson Eng. Co., Box 286, Glenview, Ill. 60025 (312) 724-1780
Habco Electronics, 603 Alleghany Ave., Towson, Md. 21204 (301) 825-9637
Norwood Scroggs Co., 2221 Arbor Hills Rd., Jackson, Mich. 49201 (517) 750-1170
Quantum Sales, 7710 Computer Ave., Minneapolis, Minn. 55435 (612) 831-8583
Bob Cameron, Inc., 2352 Linwood Ave., Ft. Lee, N.J. 07024 (201) 461-2595
Floyd W. Churchill, Box 43, Haddonfield, N.J. 08033 (609) 429-7871
Net Sales, Box 7485, Rochester, N.Y. 14615 (716) 467-4538
L. K. Haner Assoc., Box 101, Commack, N.Y. 11725 (516) 864-2220
A. C. Wahl & Assoc., Box 15220, Cincinnati, Ohio 42515 (513) 761-5500
SPS Electronics, 12025 N.W. Thompson Rd., Portland, Ore. 97229 (503) 645-3769
Waggoner-Verhill Assoc., 3550 Laketon Rd., Pittsburgh, Pa. 15235 (412) 241-5202
Southwest Elect., Inc., 9226 Markville Dr., Dallas, Tex. 75243 (214) 690-9881
Southwest Elect., Inc., Box 35353, Houston, Tex. 77035 (713) 729-1670
Solid State Engr., Box 355, Sta. NDG, Montreal, Que. Canada (514) 481-3313
ab Elektronic Enheter, Torogatan 13, Enskede Sweden 08/48 4839
Rapac Elect. Ltd., Box 18053, Tel-Aviv Israel 7771 151617

Technics by Panasonic, One Panasonic Way, Secaucus, N.J. 07094

Teknekron/TRAX, 2121 Allston Way, Berkeley, Calif. 94704

Tektronix Inc., Box 500, Beaverton, Ore. 97077

Telcom Research, 1163 King Road, Burlington, Ont., Canada L7R 3X5

Tele-Cine Inc., 5434 Merrick Rd., Massapequa, N.Y. 11758

Telecommunications Industries Ltd., 6335 Homewood Ave., Suite 204, Los Angeles, Calif. 90028

Telecommunications Technology, 555 Del Rey Ave., Sunnyvale, Calif. 94086

Telectric Co., 1218 Venice Blvd., Los Angeles, CA 90006

Teledyne Camera Systems, 131 N. Fifth Ave., Arcadia, Calif. 91006

Teledyne Energy Systems, 110 W. Timonium Rd., Timonium, Md. 21093

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Charles T. Morgan Co., Inc., 500 Maple St., Hathorne, Mass. 01937 (617) 774-3215 Steve Lunn
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Mechron Engineering Products Ltd., 2437 Kaladar Ave., Ottawa Ont. Canada K1V 8B9 (613) 733-3855 Ron Whiting
Simson-Maxwell, 1380 West 6th Ave., Vancouver BC Canada V6H 1A7 (604) 736-5431 Will Arffman
Alster Communications, P.O. Box 9048, Boise, ID 83707 (208) 362-1272 Russ Elsworth
Alster Communications, 1603 N. Lincoln, Kennewick, WA 99336 (509) 735-2232 Bill Holesworth
Electro Pacific, 727 Industrial Rd., San Carlos, CA 94070 (415) 592-3114 Bob Tokarski
Mid-South Sales Co., Inc., P.O. Box 692, Slidell, LA 70459 (504) 641-7480 Harry Hammet

TeleMation, A Div. of Bell & Howell, Box 15068, Salt Lake City, Utah 84115

Tele-Measurements, Inc., D 2, 145 Main Avenue, Clifton, N.J. 07014

Telemet, a Geotel Co., 185 Dixon Ave., Amityville, N.Y. 11701

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Telemet a Div. of Geotel, Inc., Western States, (408) 249-1559 Paul Welcom

Telescript, Inc., 20 Insley St., Demarest, N. J. 07627

Television Engineering Corp., 519 Rudder Rd., Fenton, Mo. 63026

Television Equipment Associates, Box 260, South Salem, N.Y. 10590

Television Products Co. Inc., 9016 Aviation Blvd., Inglewood, Calif. 90301

Television Research International, 1002 Elwell Ct., Palo Alto, Calif. 94303

Television Technology Corp., 5970 W. 60th Ave., Arvada, Co. 80003

Dr. Byron St. Clair (303) 423-1652

Telex Communications, Inc., 9600 Aldrich Ave. S., Minneapolis, Minn. 55420

Don Mereen (612) 884-4051

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David H. Brothers Co., Inc., 19 Old Court Rd., Baltimore, Md. 21208 (301) 764-7189 David Brothers
Fleehart and Sullivan, Inc., 10109 Aurora Ave. N., Seattle, Wash. 98133 (206) 522-1533 Earl W. Fleehart
Imtech Equipment Div., Inc., 6862 Engle Rd., Cleveland, Ohio 44130 (216) 826-3400 Jim Eales
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Michael Scott Co., Inc., 20 Walnut St., Wellesley Hills, Mass. 02181 (617) 235-0102 Michael Scott
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Lewis and Dunnigan Co., Inc., 104 Jamesville Rd., Syracuse, NY 13214 (315) 446-5522 Richard Dunning
J. Y. Schoonmaker Co., Inc., 10710 Sand Hill Rd., Dallas, Tex. 75238 (214) 349-1650 E. Jess Spoonts
Schalco Inc., 23716 Woodward Ave., Pleasantridge, MI 48069 (313) 547-4771 Carl Ludwig
Technical System Reps, 2065 Peachtree Ind. Ct., Suite 215, Chamblee, Ga. 30341 (404) 457-0426 Norman R. Schneider
Telak Electronics Ltd., 690 Progress Ave., Unit 3, Scarborough, Ont. M1H 3A6 Canada (416) 438-3804 Murray Balcom
World Wide Products, Inc., 10818 N.W. 6th Ct., Box 279, Miami, Fla. 33168 (305) 754-5475 Jerry Zeidman

Teltron Inc., Box 416, Douglassville, Pa. 19518

Temtron Electronics, D 1-9, 138-69 Francis Lewis Blvd., Rosedale, N.Y. 11422

Ralf Vilaire (212) 978-5896, (800) 221-8376

Tentel, 50 Curtner Ave., Campbell, Calif. 95008

Tepco Corp., Box 680, Rapid City, S. D. 57709

TerraCom, 9020 Balboa Ave., San Diego, Calif. 92123

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Texas Electronics, Box 7225, Dallas, Tex. 75209

Sam Eason (214) 631-2490

Texscan Corp., 2446 N. Shadeland, Indianapolis, Ind. 46219

Theatre Techniques Inc., 60 Connolly Parkway, Hamden, Conn. 06514

Thermodyne International Ltd., 12600 Yukon Ave., Hawthorne, Calif. 90250

Thomson-CSF Electron Tubes, 750 Bloomfield Ave., Clifton, N. J. 07015

Thomson-CSF Laboratories, Inc., 37 Brownhouse, Stamford, Conn. 06902

John J. Camarda (203) 327-7700

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Thomson-CSF Laboratories, Inc., Western Region, Box 36, LaCanada, Calif. 91011 (213) 790-4393 James Smith, Regional Mgr.
Thomson-CSF Laboratories, Inc., Northeast District, 8407 Brewster Dr., Alexandria, Va. 22308 (202) 296-9189 Al Audick, Dist. Liason Sales Mgr.
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Thomson-CSF Laboratories, Box 623, Americus, GA 31709 (912) 924-8309 O.G. (Bud) Mills, Terr. Mgr.
Thomson-CSF Laboratories, Inc., Midwest Territory, Box 95367, Schaumburg, Ill. 60195 (312) 397-1118 Louis V. Mialy, Terr. Mgr.

Thor Electronics Corp., D 1-9, 321 Pennsylvania Ave., Linden, N.J. 07036

3M Co., Magnetic Audio/Video Prod. Div., 3M Center, St. Paul, Minn. 55101

Joe Leon, Sales (612) 733-7732

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3M Co., Mincom Div., 3M Center, St. Paul, Minn. 55101

B. J. Landingham (612) 733-0803

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3M Co., (Western), 688 Wasatch Dr., Fremont, Calif. 94536 (415) 791-8344 Bill Hahn
3M Co., (Southeastern), 15932 Shady Grove Rd., Gaithersburg, Md. 20760 (301) 948-0460 Bill Weston

Time & Frequency Tech., Inc., 3090 Oakmead Village Dr., Santa Clara, Cal. 95051

Frank Stolten, Terry Lloyd (408) 246-6365

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BCD, Inc., 5526 E. La Palma, Anaheim, Calif. 92807 (714) 528-9505 John Baumann
Didier/Denver, Box 1599, Evergreen, Colo. 80439 (303) 674-6000 Herb Didier
Martin, Zienkosky, Browne & Assoc., 13731 Omega Rd., Dallas, Tex. 75240 (214) 233-5535 Darryl Parker
Emmons Associates, 10700 Lyndale Ave. S., Minneapolis, Minn. 55420 (612) 881-1118 Keith Emmons
Dyer Electronics, 31185 Ten Mile Rd., Farmington Hills, Mich. 48024 (313) 478-2157 Mike Dyer
Doug Cook & Associates, 2185 Trent Rd., Columbus, Ohio 43229 (614) 471-4114 Doug Cook
Electronic Merchandising Ent., Inc., 112 Buena Vista, High Point, N.C. 27260 (919) 869-3335 George Gold
Radlord Associates, 3203 Lanier Dr., Atlanta, Ga. 30319 (404) 237-6097 Lewis Radlord
Repelect, Box 7102, Tampa, Fla. 33603 (813) 227-5051 John Govreau
Holzberg Associates, Box 322, Totowa, N.J. 07512 (201) 256-0455 Herb Holzberg
Hope, Bennett, Blackburn, Inc., 18 La Rosa, Isla Verde, Puerto Rico 00913 (809) 725-8668 Mr. Blackburn
Caldwell A/V Equipment Co. Ltd., 1080 Bellamy Rd. N., Scarborough, Ont. M1H 1H2 Canada (416) 438-6230
BCD, Inc., 7100 S.W. Hampton St., Tigard, OR 97223 (503) 639-8223
MARCOM, P.O. Box 66507, Scotts Valley, CA 95066 (408) 438-4273
Radlord Associates, 1331 Otter Creek Rd., Nashville, TN 37215 (615) 373-0231
Besco Int'l., P.O. Box 1, Ramey Puerto Rico 00604 (809) 891-1510
Doug Holland Associates, 6370 Hawaii Kai Dr., Honolulu, HI 96825 (808) 377-6633

Time Tech Corp., 625 Katella Ave., #35, Orange, Calif. 92667

Richard E. Miller (714) 639-4445

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Cleveland Enterprises of Colorado, P.O. Drawer P, Aurora, CO 80041 (303) 751-3252 Richard T. Seery
H.M. Dyer Electronics, 31185 Ten Mile Rd., Farmington Hills, MI 48024 (313) 478-2157 Mike Dyer
Professional Products, Inc., 4962-64 Fairmont Ave., Bethesda, MD 20014 (301) 657-2141, 656-5100 Phil Boton
Sound System, Inc., 52-12 Twenty-Eighth St., Long Island City, NY 11101 (212) 786-4474, 4386 Dick Mulliner
Video Equipment Corp. of America, 7377 Convoy Court, San Diego, CA 92111 (714) 278-4400 Jerry Frazier

Times Wire and Cable, 358 Hall Avenue, Wallingford, Conn. 06492

Tiner Communications Service, Inc., D, Box 817, Cedar Hill, Tex. 75104

Torpey Controls & Engineering Ltd., 108 Carnforth Rd., Toronto, Canada M4A 2L4

Townsend Associates, Inc., Box 1122, Westfield, Mass. 01085

Track Audio, Inc., D 1-9, 33753 9th S, Federal Way, Wash. 98003

Transtector Systems Div., Konic International Corp., 532 Monterey Pass Rd., Monterey Park, Calif. 91754

Tri-Tronics, Professional Electronics, Box 1067, Hwy. 210 N., Lillington, N.C. 27546

Trompeter Electronics, 8936 Comanche Ave., Chatsworth, Cal. 91311

U

UHF Associates, Box 24, Jenner, Calif. 95450

UMC Electronics Co., Broadcast Products Div., 460 Sackett Point Rd., North Haven, Conn. 06473

Chuck Rockhill (203) 288-7731

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M.S.C. Electronics, Ltd., 254 Wildcat Rd., Downsview, Ont. M3J 2N5 Canada (416) 661-4180 Dennis Hindstridge
Seltech Equipment Ltd., 16 York Rd., Maidenhead, SLG 1SF England (0628) 36315 Bill Jeynes
Audio Profesionales, S.A., Rio Nazaz No. 26, Desp. 8, Mexico 5, D.F. Mexico 535-77-47, 535-33-67 Alejandro Zendejas Lopez
Jesus Soto, P.O. Box 487, Caguas, Puerto Rico 00625 744-313
Broadcast Services & Products Ltd., 60 Airdale St., City Box 460, Auckland New Zealand 71-501 Chris Prouse
Intermedia-Broadcast Center, 405 Altura St., Santa Mesa, Manila Philippines 2806 62-32-20, 62-34-89 Felix Zamora, Jr.

Uher Corp., 85 Lawrence St., Hackensack, N.J. 07601

Ultra Audio Pixtec, Box 921, Beverly Hills, Cal. 90213

Unarco-Rohn Div., of Unarco Ind., Inc., Box 2000, Peoria, Ill. 61656

Unimedia Corp., 22525 Kingston Ln., Auburn, Calif. 95603

Union Connector Co., Inc., Box H, Roosevelt, N. Y. 11575

United Radio Supply Inc., D9, Box 14040, Portland, Ore. 97214

United Recording Electronics Industries, 8460 San Fernando Rd., Sun Valley, Calif. 91352

Up-Right Scaffolds, 1013 Pardee St., Berkeley, Cal. 94710

Utah Scientific, Inc., 2276 South 2700 West, Salt Lake City, Utah 84119

Lyle O. Keys (801) 973-6840

V

VIF International, D 1-9, Box 1555, Mountain View, Calif. 94042

Gordon MacKenchnie (408) 739-9740

Vacuum Tube Industries, 35 Pequit St., Canton, Mass. 02021

Eugene Tosti (617) 828-1650

Valad Electric Heating Corp., 160 Wildey St., Tarrytown, N.Y. 10591

Thomas Valentino Inc., 151 West 46th St., New York, N.Y. 10036

Val-Tronics, Inc., D2, Penn Park Bldg., Pittston, Pa. 18640

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Vamco Engineering, 11104-C.E. 56th St., Tulsa, Okla. 74145

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The Gene Sudduth Co., Inc., 845 39th S.E., Paris, TX 75460 (214) 785-5764 Gene Sudduth

VanLadder, Inc., Box 709, Spencer, Iowa 51301

James C. Baker (712) 262-5810

Varian Associates, Inc., Electron Device Group, 611 Hansen Way, Palo Alto, Calif. 94303

Varian/Beverly, Micro-Link Products, 8 Salem Rd., Beverly, Mass. 01915

Vector Electronic Co., Inc., 12460 Gladstone Ave., Sylmar, Calif. 91342

Vega, Div. of Cetec Corp., Box 5348, El Monte, Calif. 91731

Paul Baughman (213) 442-0782

Versa Count Engineering, 553 Lively Blvd., Elk Grove Village, Ill. 60007

Victor Duncan, Inc., D 4,5,6,7, 2659 Fondren Drive, Dallas, Texas 75206

Video Aids Corp. of Colorado, 325 E. 7th St., Loveland, Colo. 80537

Video Associates, 8301 Balcones, Suite 313, Austin, Texas 78759

Video Components, Inc., 601 So. Main St., Spring Valley, N.Y. 10977

Dick Turchen (914) 356-3700

Video Data Systems, 40 Oser Ave., Hauppauge, N.Y. 11787

Video Devices Co., 3304 Silver Oak Lane, Vista, Calif. 92083

Video Memory Corp., c/o Recortec, Inc., 777 Palomar Ave., Sunnyvale, Calif. 94086

Video Research Corp., Interstate Industrial Park, Riviera Beach, Fla. 33404

Video Specialties, 4178 A Sorrento Valley Blvd., San Diego, Calif. 92121

The Video Tape Co., 15045 Burbank Blvd., North Hollywood, Calif. 91601

Video Tape Exchange Div. of Cine Film Exchange Inc., D 1-9, 855 Avenue of the Americas, New York City, N. Y. 10001

Joe Liucci, Alvin Poll (212) 695-6644

Videodetics Corp., 2121 S. Manchester, Anaheim, Calif. 92802

Videomagnetics, Inc., 155 San Lazaro Ave., Sunnyvale, Calif. 94086

Videomax Div., Orrox Corp., 3303 Scott Blvd., Santa Clara, Calif. 95050

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Videomedia, 250 North Wolfe Rd., Sunnyvale, Calif. 94086

Videotek, Inc., 125 N. York St., Pottstown, Pa. 19464

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Total Associates, 2501 Evergreen, Plano, TX 75075 (214) 596-1315 Paul Jones
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Wahlberg Associates, 79 Mystic St., Arlington, MA 02174 (617) 646-5394 Eric Wahlberg

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Vital Industries Inc., 3700 NE 53rd Ave., Gainesville, Fla. 32601

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Vital Industries, Inc., West Coast Div., 7960 West Beverly Blvd., Los Angeles, Calif. 90048 (213) 653-9438 Barry Holland

W

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William McFadden

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Waters Mfg. Inc., Longfellow Center, Wayland, Mass. 01778

Donald A. Russell (617) 358-2777

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INH Component Sales, 160 Winchcombe Dr., Dayton, Ohio 45459 (513) 434-8808
Dynatech, Inc., 5600 S. Syracuse Circle, Suite 308, Englewood, Colo. 80110 (303) 773-2830
Ozark Electronic Marketing, Inc., 2573 Woodson Rd., St. Louis, Mo. 63114 (314) 423-7200
Fred Peterson Co., Box 800, Hopkins, Minn. 55343 (612) 941-5400
Sales Engineers Ltd., 7580 Stage Rd., Buena Park, Calif. 90621 (714) 521-8673
Sir Associates, 442 Marrett Rd., Box 24, Lexington, Mass. 02173 (617) 862-1812
Sonny Simberkoff Assoc., Inc., 71 Valley St., South Orange, N.J. 07079 (201) 763-7900
R. P. Urban & Associates, 1119 Burton St. S.E., Grand Rapids, Mich. 49510 (616) 245-0511
The Woodworth Co., Box 2165, Redwood City, Calif. 94061 (415) 365-0252

Weather Scan, Inc., D, Loop 132 & Hwy. 79, Olney, Tex. 76374

Weinschel Engineering Co., 1 Weinschel Ln., Gaithersburg, Md. 20760

Western Electronic Products Co., 107 Los Molinos, San Clemente, Calif. 92672

Westinghouse, Ind. & Govt't Tube Div., Westinghouse Circle, Horseheads, N.Y. 14845

Westlake Audio, 6311 Wilshire Blvd., Los Angeles, Calif. 90048

Whirlwind Audio, Box 1981, Rochester, N.Y. 14603

Whirlwind Music, Box 1075, Rochester, N.Y. 14603

Wide Band Engineering Co., Inc., Box 21652, Phoenix, Ariz. 85036

Wide Range Electronics, 2119 Scheutz Rd., St. Louis, Mo. 63141

Al Russell, Marketing Mgr. (314) 567-5366

The Widget Works, Inc., Box 79, Medina, Ohio 44256

Wilkinson Electronics, Inc., Box 738, Trainer, Pa. 19013

Joanne Hall (215) 497-5100

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S.A.V.C.O., Box 427, Richardson, Tex. 75080 (214) 234-1841 Nathan Hughes
Broadcast Consultants Corp., 21 N. Wirt St., Leesburg, Va. 22075 (703) 777-8660 David Green
Electronic Industries, Inc., 19 E. Irving Ave., Oshkosh, Wis. 54901 (414) 235-8930 Bud Tedlie

Wilmore Electronics Co., Inc., Box 2973, Durham, N.C. 27705

Winegard Television Systems, 3000 Kirkwood, Burlington, Iowa 52601

Winsted Corp., 8127 Pleasant Ave. So., Minneapolis, Minn. 55420

Jerry Hoska (612) 888-1957

Wolf Coach Inc., 200 Bartlett St., Northboro, Mass. 01532

World Video Inc., Box 117, Boyertown, Pa. 19512

Y

Yamaha International Corp., 6600 Orangethorpe Ave., Buena Park, Calif. 90622

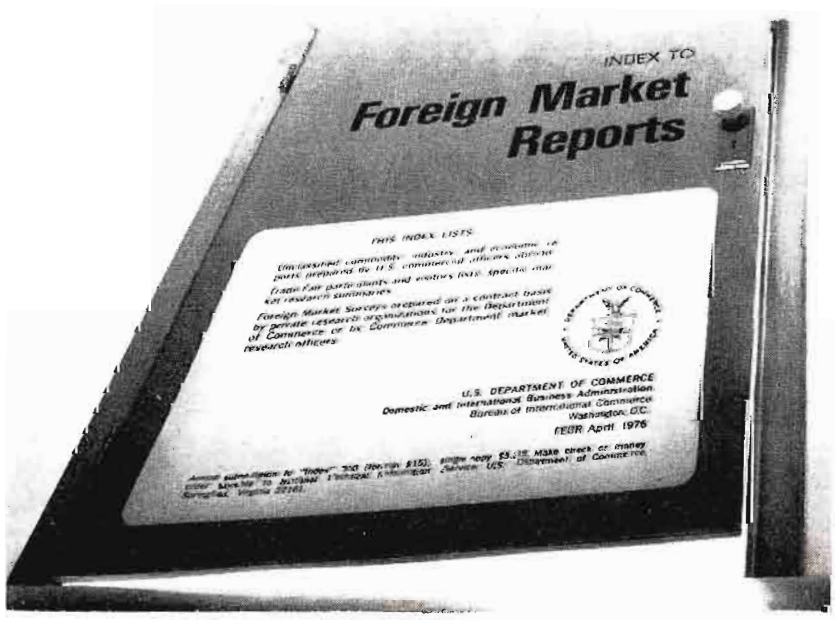
Yardney Electric Corp., 82 Mechanic St., Pawcatuck, Conn. 02891

Z

The Zei-Mark Corp., Box 182, Brookfield Center, Conn. 06805

Product Listings Begin on Page 122

If you're into exporting, or about to take the plunge, this could be your market research department.



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Becoming a certified broadcast engineer

By Jim Wulliman, chairman of the SBE certification committee.

Over 1500 broadcast engineers have recognized the value of certification to themselves and to the broadcast industry.

The evaluation of the 1978 exams has been completed and the names of those who have met the qualifications will be published in the next issue of the SBE *Signal*.

A major objective of the certification program is "to encourage broadcast engineers to continue their professional development." Certification is awarded for a period of five years and those certified must accumulate professional credits for recertification.

During the five year period, a senior broadcast engineer must accumulate 25 professional credits and a broadcast engineer must accumulate 20. The credits claimed must be selected from at least four of the categories listed here:

- Employment as a full-time manager or supervisor, or at a decision-making level in broadcast engineering, or as a consultant or equivalent, two credits per year; or full time employment in broadcast engineering or a closely associated field. One credit per year.

Those claiming this credit must provide a statement of the work performed and the period claimed, or provide a statement that there has been no change in his or her responsibility or qualifications since certification. Either statement must be attested to by his or her supervisor.

- Successful completion of an accredited course in broadcast engineering or related field, either as a student or as a teacher, one credit per 10 contact hours.
- Presentation of a significant paper or talk on a broadcast engineering subject before a national or regional engineering meeting or conference, five credits per paper or talk. Presentation for a local chapter technical meeting, one credit per paper or talk.
- Publication of a technical artical in a national broadcast periodical, two to 10 credits per article. The certification committee will determine the credit value based on the significance of the article. Publication of an article in a local chapter puglication, one credit.
- Active membership and participation in the SBE or other national technical society related to broadcasting, one credit per group per year. (Maximum 10 credits.)
- Active participation as an elected or appointed officer or committee member in the SBE or other society, either at a local or the national level, two credits per group per year. (Maximum 10 credits.)
- Attendance at local, regional, or national SBE meetings and other technical conferences and seminars, 0.5 credit per local meeting, one credit per day for attending conferences, seminars, and workshops of one or more full day's duration.
- Home study courses may qualify for professional credits as evaluated by the certification committee. Please write to the committe for a ruling.
- Other activities involved in the broadcast engineering field may qualify for professional credits at the discretion of the certification committee. Please write the committee for a ruling.

It will be the individual's responsibility to keep his certification record of professional credits up-to-date by submitting the proper statements or forms, attesting to his activities and/or participations, periodically to the chapter chairman. One year before his certification expires, the individual should review his certification record for shortages of credits. The certification committee reserves the right to ask any individual for verification of any or all of the professional credits claimed.

Application for recertification will be accepted six months prior to expiration of the five year period as shown on the applicant's certificate.

If the certified broadcast engineer elects to recertify by taking the examination, he or she must notify the certification secretary six months prior to the examination.

We have tried to make the requirements flexible enough to make recertification attainable by a broadcast engineer who is actively working to improve his and the broadcast industry's status. This is much more difficult for the isolated station engineer, who is not able to participate in chapter activities. However, I believe that we have provided enough options so that anyone who is actually qualified for certification can demonstrate that fact to the certification committee.

For further information, write to the Certification Secretary, P.O. Box 50844, Indianapolis, IN 46250. □

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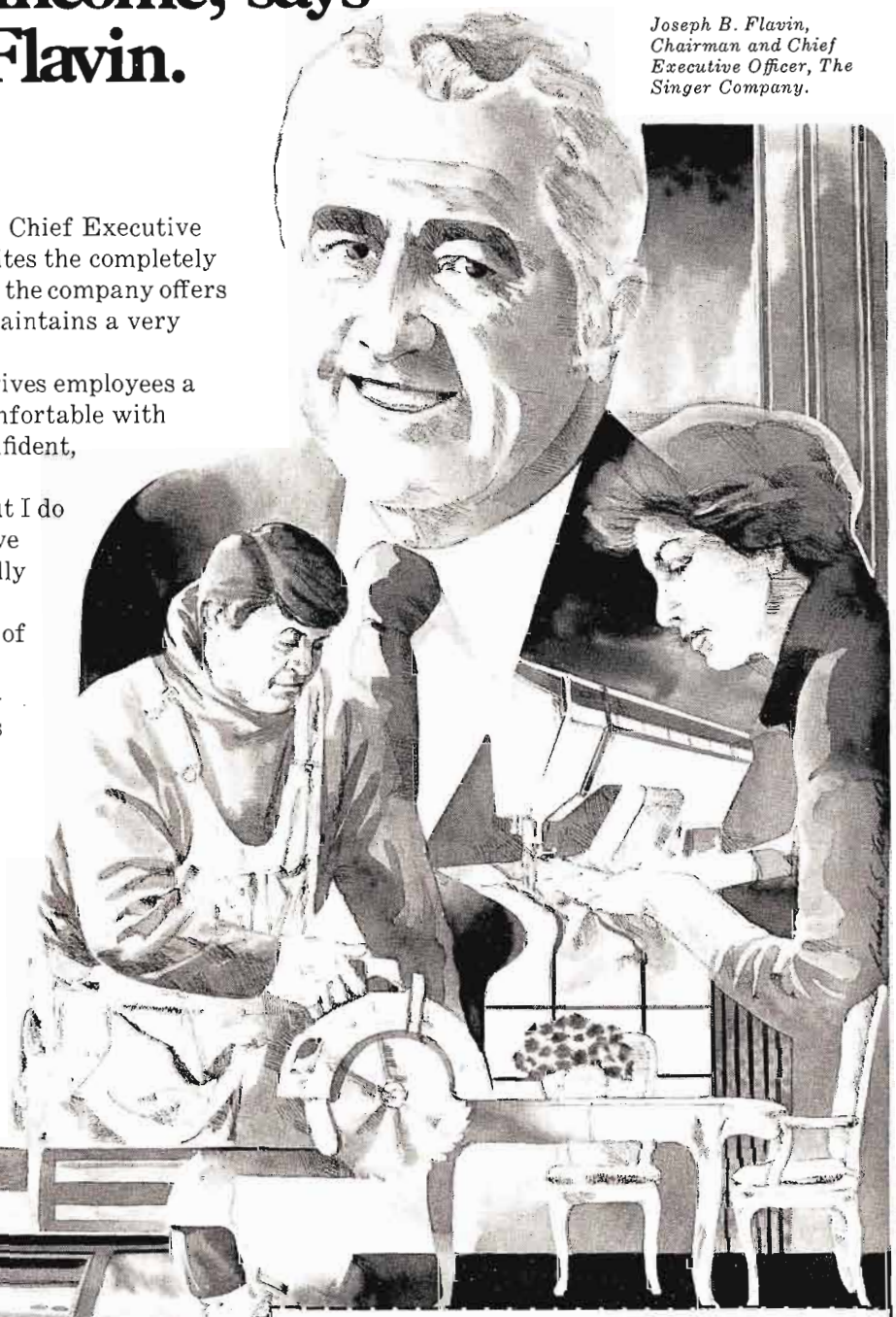

Joseph B. Flavin, Chairman and Chief Executive Officer, The Singer Company.

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Mr. Flavin also feels Bonds are important to the economy "because they don't attack the area from which corporations draw their money."

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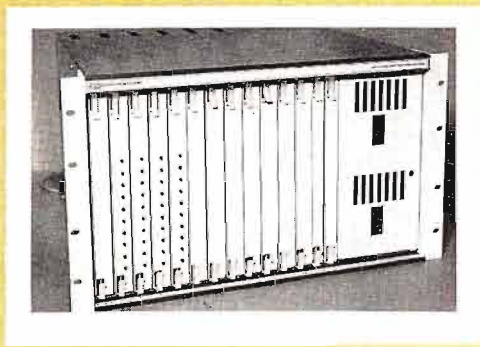
Routing switcher roundup

Part 3 (Part 1 of this roundup can be found in the July, 1978 Broadcast Engineering, while Part 2 can be found in the August, 1978 issue).

For more information, circle **bold face** number on Reader Service Card: The Grass Valley Group 400 Series **(630)**, 3600 series **(631)**, 3200 series **(632)**; TeleMation TVS/TAS-1000 **(633)**; Utah Scientific AVS-1 series **(634)**, CAV-7 series **(635)**.



Manufacturer and model number	Model description
Utah Scientific	
AVS-1 Series	
AV-20/20	This compact switcher features a 20 x 20 AFV matrix in a single card cage complete with one or two power supplies and one or two control and memory cards.
AV-50/10	This configuration provides 10 audio and 10 video outputs from each card cage with a maximum of 50 inputs. Maximum permitted size is 50 x 100 AFV.
A-50/20 and V-50/20	Separate card cages are used for audio and video to provide 20 outputs per card cage from up to 50 inputs.
A-100/10 and V-100/10	One hundred inputs are accommodated by using separate audio and video card cages for each 10 outputs. Maximum standard size is 100 x 100 AFV. Custom sizes to 150 x 150 and larger.
A-20/20-S	Designed for stereo/audio switching with each card cage providing 20 outputs from a maximum of 50 inputs.
A-50/10-S	A stereo/audio switcher providing 10 outputs per card cage from a maximum of 50 inputs.
CAV-7 Series	
CAV-20/10	Provides 10 outputs from either 10 or 20 audio and video inputs.
CV-50/10	10 x 10 to 50 x 10 video only.
CA-50/10	Provides 10 audio or time-code outputs from up to 50 inputs. Slave model available for coupling to CV-50/10.
CV-20/20	Provides a maximum of 20 video outputs from a maximum of 20 video inputs.
CA-20/20	20 x 20 audio switcher available with built-in control system or for use as slave to CV-20/20.
CA-20/10-S	Switches a maximum of 20 stereo inputs to 10 stereo outputs.
CT-384	Tally matrix. Switches digital, analog, or control signals on mutually exclusive, bi-directional or reverse-only signal paths. Add-on to AVS-1, CAV-7 or switchers of other manufacturers. 8 x 8 to 96 x 96 matrix sizes.

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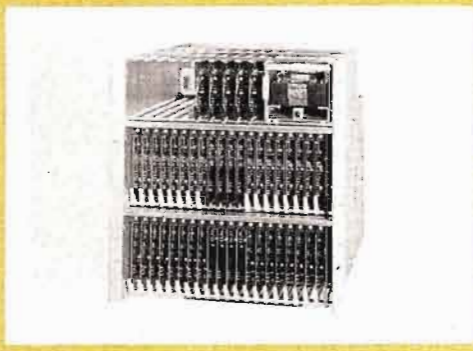
Routing switcher roundup

continued from page 239

Manufacturer and model number	Model description

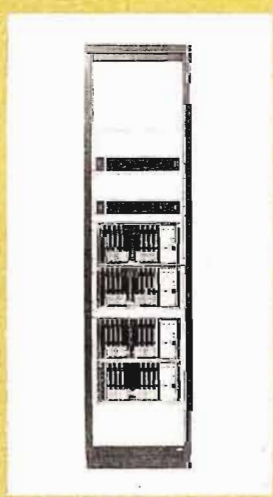


The Grass Valley Group

400 Series The basic video switching matrix is arranged in a 32-input by 16-output format. A frame contains 21 printed circuit modules consisting of four input buffer amplifiers, 16 crosspoint modules, and an interface module. The audio switching matrices consist of input buffer modules, crosspoint modules and a single interface module. A tally relay matrix is available to provide contact closures corresponding to input sources. Other features include: DC restored inputs, vertical interval switching, destination oriented matrices, and built-in short term memory protection.

3600 Series The video matrices consist of an input fanout system, an array (matrix) of crosspoints, and an output system. Video crosspoints are arranged on 10-input, 1-output circuit modules. Ten modules can be mounted in a 1¾-inch high frame to form a 10 x 10 matrix. Audio matrices are arranged similarly to video matrices. Input and output impedances are 600 ohms, balanced to ground.

3200 Series This model is intended for general purpose, utility video or audio switching applications. Symmetrical matrices up to 8 x 8 and assymmetrical matrices up to 29 x 2 can be assembled from the series components. Each audio or video mounting tray accommodates eight 8 x 1 modules and a power supply.



TeleMation

TVS/TAS-1000 Has up to 1,000 crosspoints per 8¾-inch chassis. Features include solid-state crosspoints with vertical interval switching; single-coax "party-line" control; wide selection of bus controls and status monitors; dual video outputs; and automatic restoration after power failure, with Refresh Memory option. No splitters, combiners or distribution amplifiers required regardless of system size or expansion requirements. Recent additions to the switcher are the CP-1020 remote control panel which can switch any one of 20 input signal sources to a single output bus; the SM-1030 status light display which monitors the "party line" and identifies the output users through the use of LEDs; and the CP-1010 category/number control panel which can switch any one of 100 inputs to a single output bus while requiring only 1¾-inch space in a standard 19-inch rack.

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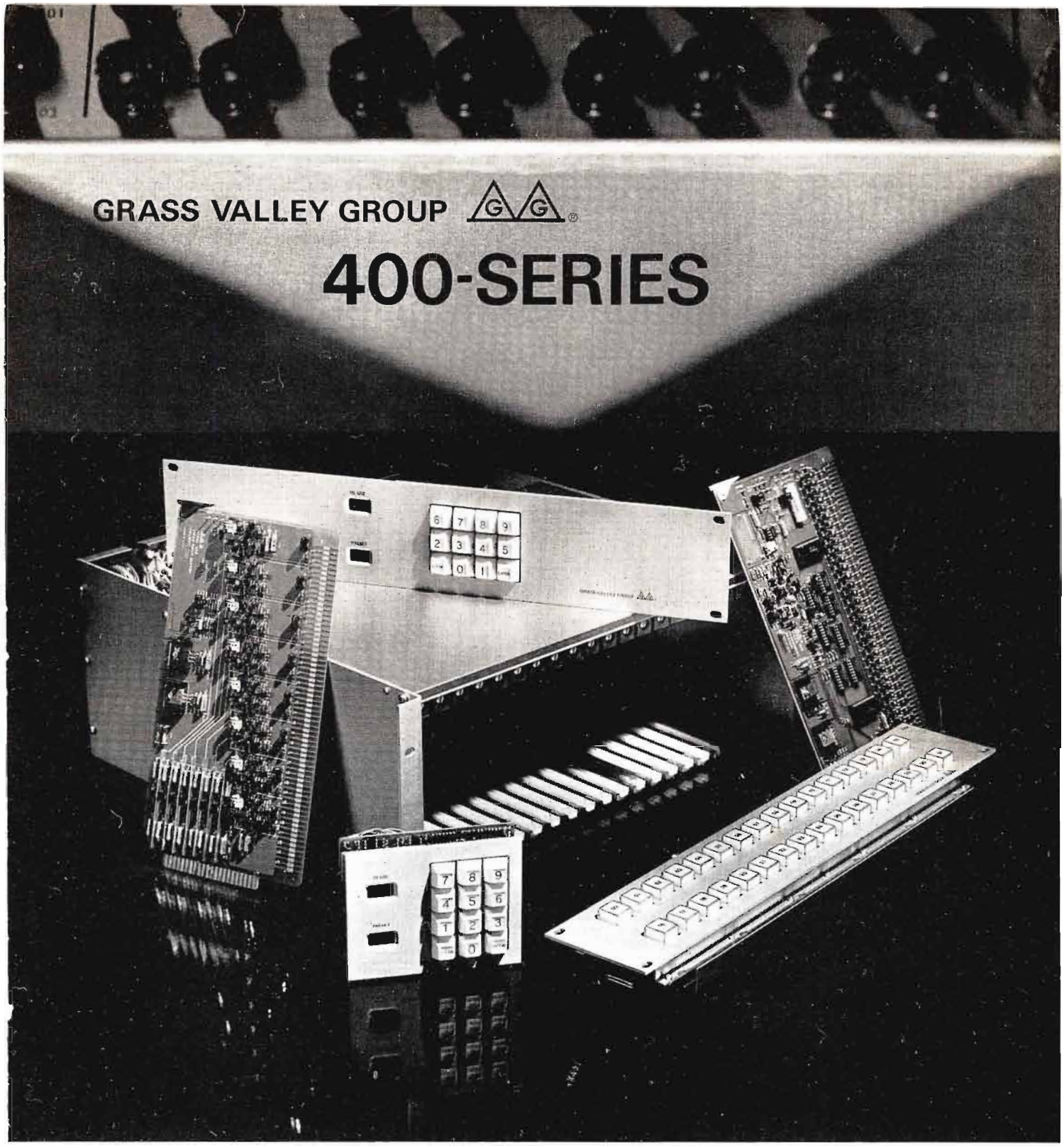

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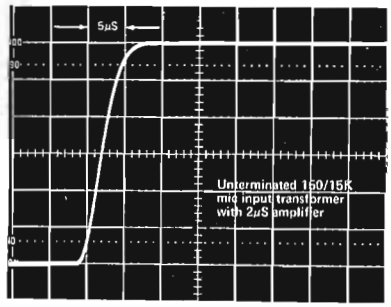

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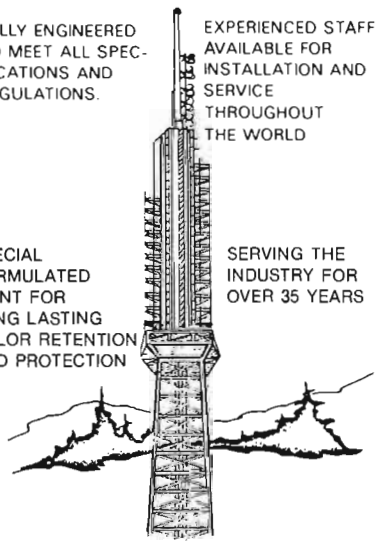

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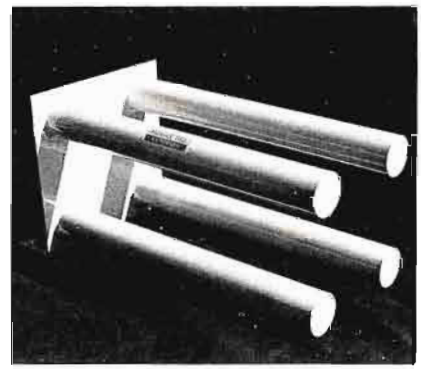
new products

Antennas

Nurad has designed three antenna systems for various uses.

First is the Hemi hemispherical antennas for airborne TV microwave systems. The Hemi provides complete hemispherical coverage below the aircraft on which it is installed.

Next is the Slimline directional circularly polarized antenna. Operating in the 2 GHz band, it is useful with microminiature portable ENG/EJ transmitters.



The third is the Quadron, a 7/GHz counterpart to the Goldenrod. It embodies four rod antennas on a common mount. Featuring a gain of 22 dB, its primary use will be as a mobile low-windload transmit antenna operated in conjunction with quad-polarized receive antenna systems.

Circle (300) on Reply Card

Blanking interval meter

Auburn Instruments' DBM-1 digital blanking interval meter measures horizontal and vertical blanking widths in the region between zero and 7.5 IRE units.

The unit is not intended to completely replace a waveform monitor and knowledgable operator, but rather, to flag an operator's attention to a critical blanking problem.

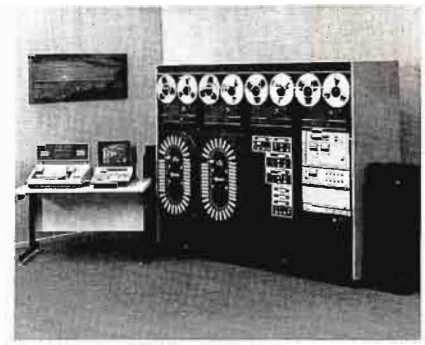
Potential uses of the meter include screening of incoming program and commercial material as well as monitoring of the outgoing program line.

Circle (301) on Reply Card

Automation system

Broadcast Electronics has introduced the control 16 microprocessor program automation system.

The system provides versatility in programming and time-oriented operations through two-way communication between the system and the operator. This is possible with five CRT displays, which tell the operator what the system is doing and what it will be doing in the future.



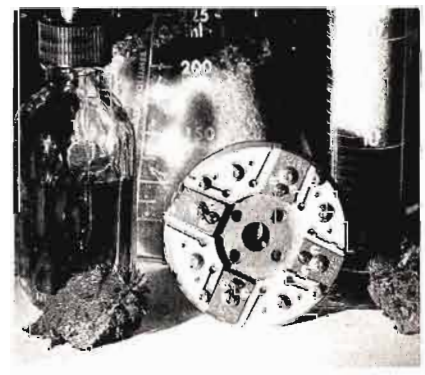
Control 16 can handle 16 program sources with a 3000 event memory. A 12/24-hour self-correcting digital clock system and 500 event compare time memory with 17 programmable functions are included.

A four-mixer stereo console, model 4S50, is also new. The 12 input console has cue switches on all faders.

Circle (302) on Reply Card

Video heads

The XM series of quadruplex video heads from *Videomax* features Megamite, a long-life tip material. The ferromagnetic spinel has been developed with the physics, chemistry, and operating parameters of broadcast video magnetic recording in mind.



The video tips are unaffected by varying tape chemistry, resistant to noise-generating microfractures, thermodynamically stable, and electromagnetically optimized for quad

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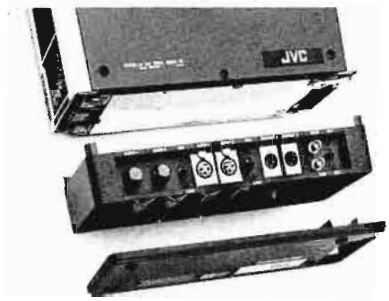
videotape recorders.

Circle (303) on Reply Card

Add-on A/V kit

An add-on audio/visual kit which adds broadcast features to standard ¾-inch portable VTRs is available from *Videomedia*.

Model VMU-44 offers balanced audio/low impedance, XLR connectors, external sync and subcarrier, and RF connector acceptance.



The kit also features individual gain pots and a microphone/line switch for each audio channel.

The VMU-44 works with the JVC CR-4400, Hitachi SV-340 or Panasonic NV-9400 VTR and is installed with a soldering iron and a Phillips screwdriver.

Circle (304) on Reply Card

Headsets

Telex has announced a line of four headset models designed for use in high noise environments.

The HearDefender headset features foam-filled earcups and cushions which surround the ear to maximize noise attenuation. A wide headband with a snap-on comfort cushion distributes the weight of the unit evenly over the head while allowing air flow to alleviate perspiration problems.

Model HD-1 is a protective ear device to attenuate high noise. Model HD-2 is a headphone for listening to intercom information. Model HD-3 is equipped with a noise cancelling dynamic microphone and model HD-4 features a superior electret noise cancelling microphone.

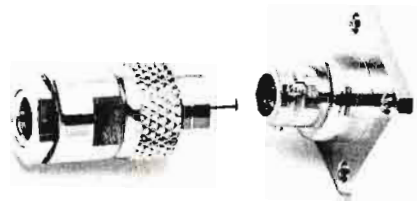
Circle (305) on Reply Card

Connectors

Trompeter Electronics has introduced a line of electro-optical connectors for single and bundle fiber communications.

Two types of all metal single channel connectors are fabricated; the threaded SMA and the quick disconnect bayonet TPS.

Both will accommodate single fibers as small as 125 µm up to bundles as large as 1143 um in diameter.



The threaded SMA is a fragile connector, particularly for field use, and requires precision torquing in assembly.

The TPS is slightly larger and more rugged than the SMA, uses a three lug bayonet for stability, is positive locking and requires no torquing.

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Edit code generator

EECO's MTG-550 Series master time code generator generates standard SMPTE/EBU Edit Code formats used for electronic indexing of video and audio tapes.

Standard features include: the ability to slave the generator to an external source of time code for add-on recording; encoding the aux-

continued on page 244

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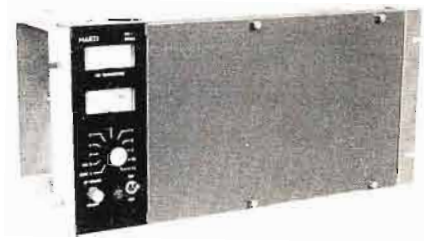

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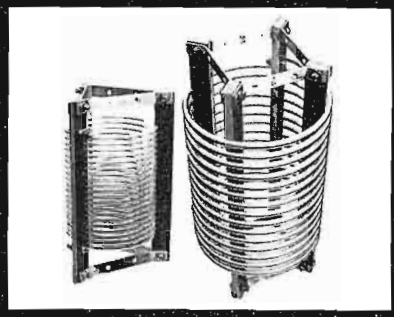

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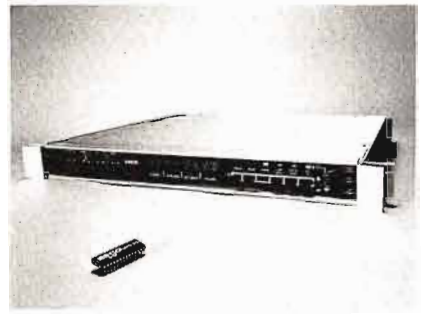
New Products

continued from page 243

iliary binary word from four different sources; special status/alarm signals to alert the user to loss of time code, loss of video/sync as a



reference, loss of phase lock and momentary power loss with selectable internal audible alarm; and a hexadecimal display which allows selection of either binary word or edit code for display.

Circle (307) on Reply Card

Bandpass filters

Allen Avionics has announced a line of LC synthesized bandpass filters. These units offer a 40 dB to 3 dB bandwidth ratio of under 2.75, and a delay variation of less than 10% over the entire 3 dB passband.

Units can be manufactured with bandwidths of from 2% to 70% of their center frequencies over a frequency range from 1 kHz to 25 MHz.

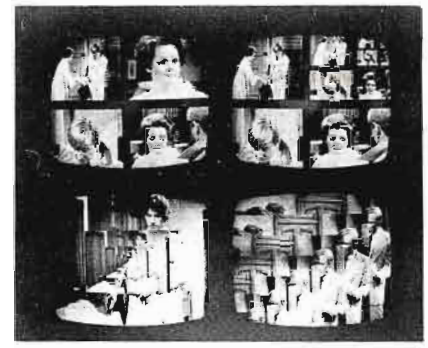
Circle (308) on Reply Card

Visual effects

Available from *RCA* are visual effects for their digital video frame synchronizer.

Designated the TFS-121, the system locks automatically to the TV station sync and all non-synchronous signals to produce smooth intermix of remote and studio sources.

The picture freeze accessory, which allows the picture output of the synchronizer to be retained frozen on the screen, includes an auto-freeze mode.



The picture compressor option, which allows the operator to reduce a full-size picture to one-fourth its original size, now includes quad freeze.

Circle (309) on Reply Card

Field service kit

A field service kit which can prevent electrostatic charge from damaging delicate electronic printed circuit boards during repair operations is available from *3M Company* Static Control Systems.

The Velostat 8005 field service grounding kit provides a method of draining electrostatic charge from the field technician to ground before it can destory sensitive board components.

The kit consists of one 10-mil Velostat Table Top, (24-inch square); one conductive wrist strap; and one ground cord.

The table top has storage pockets and can be rolled or folded to fit neatly in tool boxes.

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Recording console

Quantum Audio Labs has intro-

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duced QM-8B, a 4-buss recording console with 8-track monitor and cue capability.

Each input line has solo, panning, three special effects sends, a 15 dB pad in the mic preamp and a three knob equalizer. Two frequencies are available on each knob along with an in/out switch.

The signal is routed through a plastic fader to four output assignment switches. The pan pot has an in/out control for left-right panning or straight buss assignments.

The output section includes buss trim controls, board master and a VU meter on each buss. The console's slew rate is greater than 10 volts per microsecond and distortion is .05% THD. Headroom at the output is 17 dB and the output is tailored for +4 dBm.

Circle (311) on Reply Card

Timer/counters series

A specially designed 05 high stability oscillator for the PM6620 series of Philips timer/counters has been introduced by *Philips Test and*

Measuring Instruments, which increases stability to less than 5×10^{-10} per 24 hours and 5×10^{-9} for the temperature range of 0 degrees C to 50 degrees C.

The series offers frequency ranges at 80, 520 and 1000 MHz. Options include battery, BCD output, IEEE interference, 19-inch rack mount, carrying case and IF display offset unit.

Special features include trigger hold-off, independent trigger selection for channels A and B of AC/DC coupling, slope and attenuation.

Circle (312) on Reply Card

Cadmium cells

A line of ultra high capacity nickel cadmium cells has been announced by the Electronic Components Division of Panasonic Company.

Packaged in standard Sub-C, C, and D sizes, these cells offer anywhere from 20% to 30% more capacity (ampere hours) than conventional cells of the same size.

The cells are available both as individual cells and also in batteries of required voltages.

Circle (313) on Reply Card

Diagnostic system

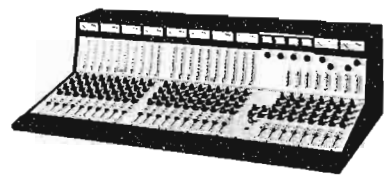
Pinzone Engineering now offers a Reflex/Command Diagnostic unit for the TCR-100 and the RCD-100. Its purpose is to assist in maintenance of the TCR by providing the operator with information that can be relayed to maintenance personnel.

By means of a 210 unit LED array, indicates the last completed step, the instantaneous status of the reflex/command logic, the logic conditions necessary for the next step to be achieved, and special indicators for singular fault condition.

Circle (314) on Reply Card

Recording studio console

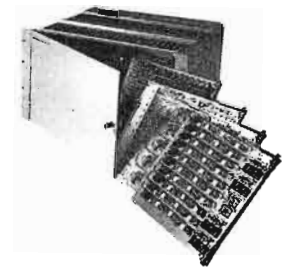
Model 2008-RS recording studio console from *Opamp Labs* features a 16-track mixdown-monitor system.



Twenty input channels consist of

continued on page 246

Computer Controlled Switcher



SYSTEM 21 SWITCHING

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New Products

continued from page 245

mix slide pot, film type, with 90 dB of attenuation.

Standard features include: eight master pots; 16 stereo earphone pots; 16 mixdown concentric pan-gain potentiometers; talkback and slate push buttons, microphone, gain controls; built-in five frequency oscillator; stereo record and monitor amplifiers; and external rack mounted power supplies.

Circle (315) on Reply Card

Monitor prompting system

Listec's Digivision Prompting System consists of a 12-inch professionally engineered monochrome monitor for below the lens positioning, complete with monitor, hood and semitransparent mirror (equivalent to 85% transmission).

The unit is encased in lightweight plastic molding. Total weight of the monitor, hood and mirror assembly is 22 pounds.

Circle (316) on Reply Card

Phono preamp

The BPA-100, a low-noise, transformerless, balanced-input circuit, designed by *Logitek*, allows use of a five-lead cartridge/tone arm combination in a balanced mode, with all the hum-rejection advantages characteristic of balanced lines.

Common mode rejection is more than 100 dB at 60 Hz, allowing the preamp to be installed in a convenient location without signal degradation due to nearby hum-radiating fields.

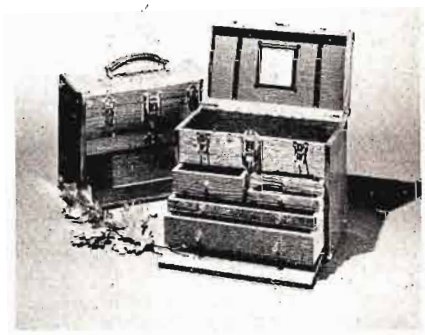
The BPA-100 is equipped with wire-capturing terminal blocks for fast installation without solder or connectors.

Circle (317) on Reply Card

Tool chest

Jensen Tools and Alloys has introduced a 5-drawer hand-crafted oak tool chest.

Made of selected seasoned, kiln dried dark oak, the cabinet-type drawers are of tongue and groove construction and cushioned with green billiard table felt.



Drawer fronts, chest side and back are solid ½-inch oak. Center hasp, latches, drawer pulls and corner protectors are nickeled steel.

Other features include a small triangular mirror mounted on the inside of the top lid, two elastic tool holders, a top till, a leatherette handle and two keys.

Circle (318) on Reply Card

Lettering machines

Three models of lettering machines from *Kroy Industries* include the Kroy 80 electric, the Kroy 61 electric, and the Kroy 61 manual.

Each machine produces KroyType, type on tape which is available in 18 type styles, in sizes from eight to 36 point.

Each typeface size is available on a separate disc, which is placed on the machine and dialed for letters, numbers and symbols.

A button causes colored dry ink to print on transparent or opaque tape. The tape has a firm paper backing which is removed before application.

Circle (319) on Reply Card

Correction window

Microtime has announced a super-wide correction window to assure correct vertical blanking from VTRs

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used in ENG be always correct.

Operator inconsistency, lack of control over outside tapes, VTR misalignment and other reasons have caused numerous FCC complaints and citations for extra-wide V-blanking.

Microtime's super-wide window allows such wide blanking to be processed through its ±12 line range, with the TBC output blanking per FCC specifications.

An additional feature is Auto-Trac II which centers the VTR output in the correction range of the wide-window.

Circle (320) on Reply Card

Video noise meter

A video noise meter that utilizes a new principle of noise measurement is available from *Lenco*.

Model VNM-428 is designed specifically for video signal-to-noise measurement requirements of TV studios, CATV installations and microwave system users where portability, simplicity of operation and accurate measurements are required.

The noise meter has a built-in calibrator that ensures accuracy of ±0.5 dB throughout the range of 20 dB to 55 dB. The signal-to-noise ratio is calibrated to EIA standards and is shown on a large LED display.

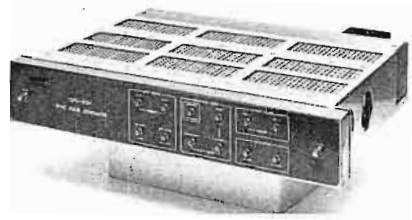
The meter may be used as a portable unit, or may be rack-mounted with an adaptor for side-by-side use with an oscilloscope.

Circle (321) on Reply Card

Sync pulse generator

Leitch Video Limited's SPG-102N digital sync generator features improved temperature stability and time base errors of less than 1 nsec. All pulse widths and timing relationships are adjustable.

The generator includes an automatic digital sync lock, switchable one or two line advance, selectable vertical blanking width of 19, 20 or 21 lines and a color frame ident pulse with choice of position.



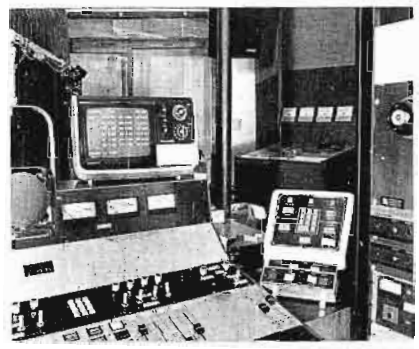
Options include high stability master color standard 100 CS; frequency converter and resolver (for external Rubidium Standard); color black, bar & dot and NTSC encoded color bar signals.

Circle (322) on Reply Card

Remote control assist

IGM has announced the MARC VII (manual assist remote control) for control of production room elements in creation of commercials.

The unit will control seven audio sources, and can manage as many as 84 tracks on multi-track recorders.



Consisting of a simple keyboard and a CRT, the MARC VII includes a built-in elapsed time read-out, enabling the operator to add overlaps and fades and to do multiple starts and special effects at precisely controlled moments.

Circle (323) on Reply Card

Program automation system

Harris Corporation's System 90 is a complete microcomputer controlled program automation system.

Several options, including announcer assist, are available. A newly expanded memory, along with repetitive day and hour entries,

continued on page 248

Off-air TV Demodulator

RX-4B

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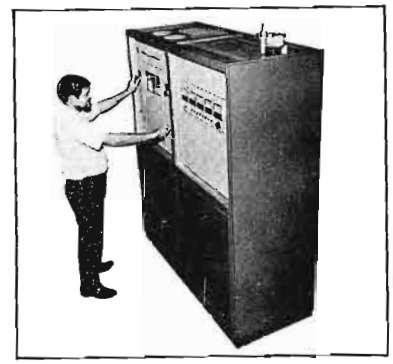

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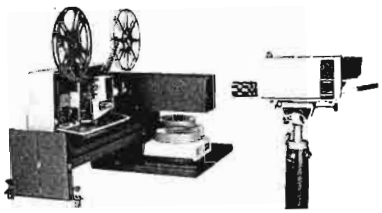

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Circle (176) on Reply Card

New Products

continued from page 247

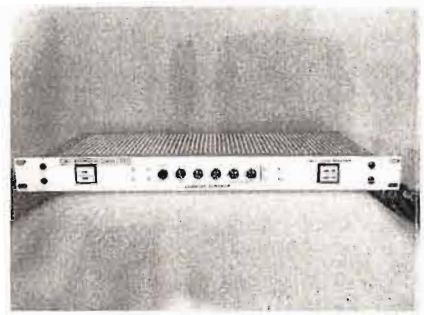
allows greater programming flexibility and saves operator time.

The 7-day CRT display, used with TEC model 70 terminal incorporates dual intensity to highlight inserted instructions and the commercial file.

Circle (324) on Reply Card

Reader-character unit

Gray Engineering Laboratories has announced a reader-character unit having four isolated character generators in conjunction with a single SMPTE time code reader.



Model DR-115 offers four isolated 75-ohm video loop inputs each with a separate video output to monitor or record.

Controls are provided to size and position the characters on the monitor, control the brightness, and insert a "box" around the characters.

Circle (325) on Reply Card

Elliptical waveguide

The *Andrew* heliax elliptical waveguides, EW52 and EWP52, are optimized for lowest possible attenuation in the 5.925-6.425 GHz band.

Assemblies of the low-VSWR EWP52 waveguide and tunable connectors are recommended for high channel capacity long-haul systems.

The EW52 waveguide is recommended for short- and medium-haul radio relay systems with low and medium channel densities and medium-haul color television microwave systems.

The heliax waveguide is formed of corrugated high conductivity copper tubing and is provided with a black polyethylene jacket for protection. It is available in long continuous lengths which can be cut to specified sizes.

Circle (326) on Reply Card

25 Hz filter

Dyma Engineering has developed an active 25 Hz filter that eliminates cue tones from program material.

It is a sharp notch filter with at least 45 dB of attenuation at 25 Hz, and less than 1.2 dB attenuation at 50 Hz.

It is available in mono and stereo.

Circle (327) on Reply Card

Signal-sampling element

Dielectric Communications has in-

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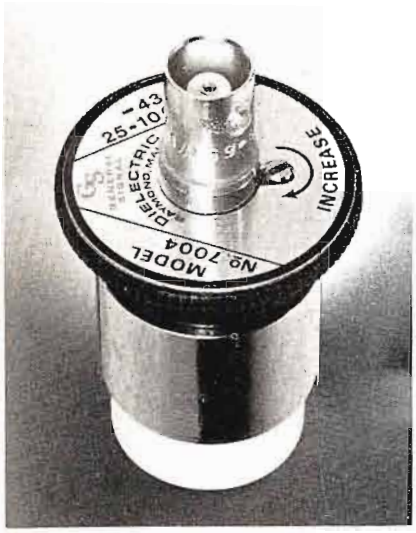
troduced the model 7004 Sniffer, a non-directional, adjustable-amplitude, RF signal-sampling element, designed to permit convenient sampling of a high-power RF signal for spectrum analysis, frequency counting or oscilloscope display.



The unit is inserted into the Dielectric model 1000 RF wattmeter, or into an auxiliary line section designed for use with the 7004. It may also be used with other RF wattmeter and line sections.

The Sniffer exhibits low VSWR and insertion loss, and can be used over the 2-1000 MHz range at power levels up to 1000 watts. RF output sample is adjustable ±8 dB around a nominal -43 dB.

Circle (328) on Reply Card

Phono cartridges

Audio-Technica's top-of-the-line stereo phone cartridges, designated the AT15SS and AT20SS, employ three refinements in the stylus and its assembly:

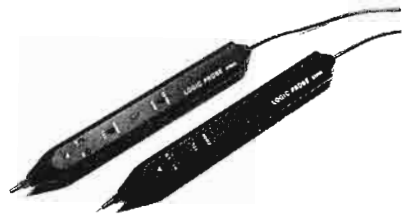
The stylus cantilever is made of beryllium, the diamond stylus Shibata tip contacts a wider up-and-down area of the record groove than elliptical styli, and the Shibata Plus stylus is a square-shanked, nude-mounted diamond that is 36% narrower than its predecessor.

Circle (329) on Reply Card

Logic test probes

Alco Electronic Products logic test probes provide dual LED indication of logic states for both TTL/DTL and CMOS circuits, with separate LEDs indicating high and low logic levels.

Model 3100A has a pulse stretcher function to capture single-shot pulses as short as 30 nanoseconds, and a memory function for latch storage of similar pulses.



Model 3200A is a similar instrument, but without memory and pulse stretching features.

Both models have clips for connection to the power source and ground system of the circuit under test and high impedance data inputs to minimize loading effects.

Circle (330) on Reply Card

Remote start platform

The Utopia I Remote Start Platform from *Grinnan Fixture Company* is custom built for a board in the same size as the bottom of a console. Remote starts are placed directly under the pots.

Circle (331) on Reply Card

continued on page 250

Remote Control Patch Panel

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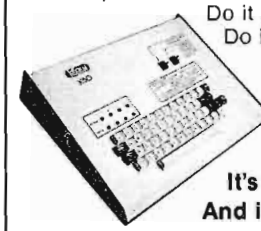

It's still a Knox. And it's still $995.

KNOX

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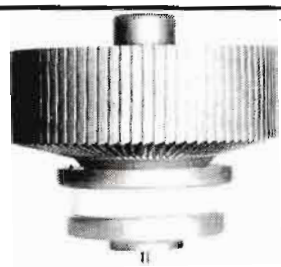

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PRICES AND CATALOG ON REQUEST

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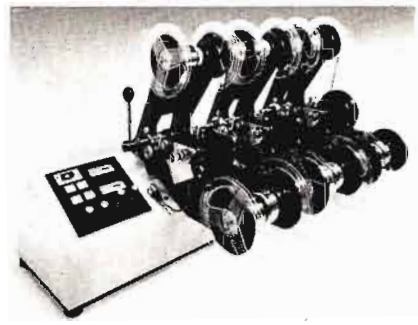
New Products

continued from page 249

Tape duplicator

Garner Industries has introduced the 1056 High Speed Professional Tape Duplicator.

It features a common precision-ground capstan which drives the master and five slaves at a constant speed. The capstan bearing surfaces are ground, diamond lapped and mounted in neoprene, eliminating metal-to-metal contact for smooth performance and increased durability.



The main drive control lever mechanically and electronically controls all transport functions.

Circle (332) on Reply Card

Zoom lens system

Angenieux now offers accessories that form the 15X system with full production on both the 15 x 9.5, 9.5-142mm, f/1.8 for ⅔-inch video cameras and the 15 x 10, 10-150mm, f/2 for 16mm cine cameras.

The retrozoom, a front mounted wide-angle attachment, changes the 15 x 10 to a very wide angle zoom, 7.5-112mm. The 15 x 9.5 is changed to 7-105mm. With this attachment, both lenses now have a minimum object field of .08 x 1-inch.

The front mounted 1.66x tele-attachment enables both the 15 x 9.5 and 15 x 10 to be used where extreme telephoto lenses would be required.

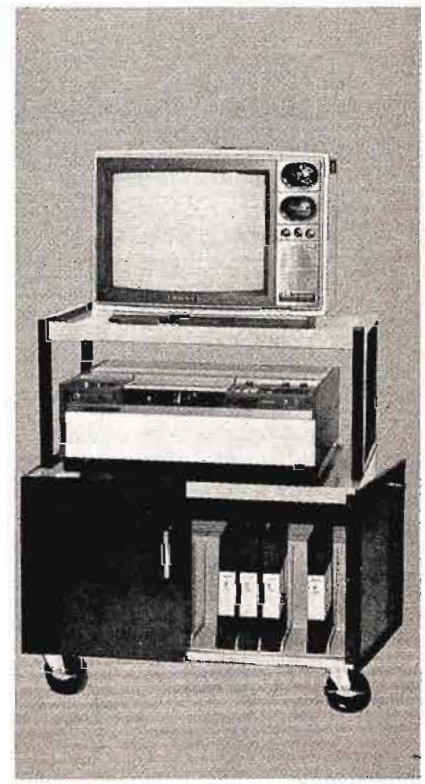
A 1.6X rear mounted range extender is used to change the focal length to a maximum of 225mm. A remote control kit allows the video camera to be used in a studio mode.

Circle (333) on Reply Card

Video centers

The *Winstead Corporation* offers three ¾-inch compact portable units to organize video equipment for fast convenient use.

Model A/V-54 is the standard-height video center, with an upper shelf accommodating a 25-inch monitor.



Model A/V-34, the low-profile video center, is designed for smaller groups and individual use. The monitor shelf is set back slighty to permit easier access to the VTR shelf.

Model A/V-37W, the executive video center, is made of walnut wood-grain laminate and holds any ¾-inch VTR machine and monitor of up to 25-inch size.

All models feature smooth rolling 4-inch industrial ball bearing casters and are finished in beige and black enamel.

Circle (334) on Reply Card

Switch panel

Farinon Electric has introduced an auxiliary transponder switch panel for use in satellite receive-only earth stations.

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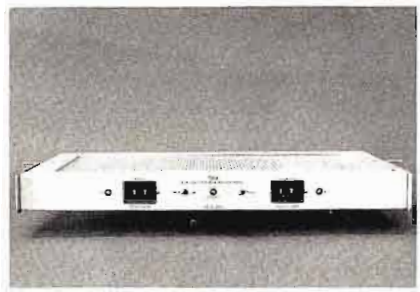
The switch panel provides remote selection of preprogrammed satellite transponder channels.



The panel controls the frequency of an earth station receiver by providing one of two preprogrammed BCD codes to the remote input of the receiver's frequency synthesized local oscillator.

Power requirements are -21 VDC, with 85 mA typical and 120 mA maximum.

Circle (335) on Reply Card

Speaker system

A keyboard speaker system, designated the S18-3, is offered by *Electro-Voice*.

The three-way system is designed for the wide range frequency reproduction likely to be encountered in reproducing synthesizer and keyboard music.

continued on page 252

Color Terminal Equipment

SERIES 5900

- Broadcast specifications
- Six-output video, pulse, audio DA's
- Six-output subcarrier and pulse delay DA's
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- Black burst generator
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Circle (183) on Reply Card

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the good neighbor.

The American Red Cross

New Products

continued from page 251

The EVM18B used in the S18-3 maintains full, low-distortion output to 40 Hz. Protected by the high frequency auto limiting circuit, the S18-3 will accept 100 watts in, while putting out 116 dB at 4 feet.

The S18-3 is bi-ampable with a tweeter and midrange level control which allows tailoring of the high end to the music or instrument being reproduced.

Circle (336) on Reply Card

Tape synchronizer

EECO's microprocessor-based MQS-100 series synchronizing system can cue and synchronize any three mag tape transports including video, audio and mag film simultaneously.

The SMPTE/EBU edit code, used for indexing of the tapes, need not be identical and tapes with drop-frame and non-drop-frame formats can be intermixed.

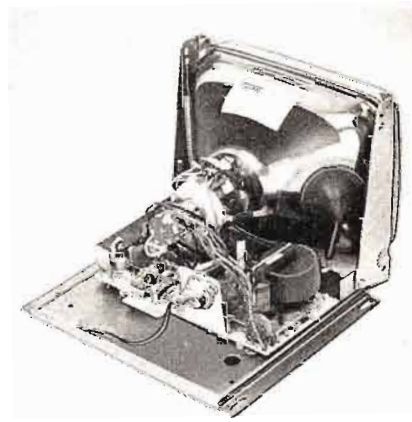
EECO MQS-100 Synchronizer

System modes include high speed search and cue, follow the leader, or chase mode, synchronized play back, fast and slow re-synchronization and roll-back with automatic re-synchronization.

Circle (337) on Reply Card

Data monitors

Electrohome Limited has introduced a V15 series of solid-state data display monitors designed for incorporation with CRT terminals displaying an 80 x 24 (1920) character format.



A modular design permits user oriented custom packaging options which include 9- or 12-inch high resolution CRTs with selectable phosphors and polished or anti-glare screens.

V15 series units are available with as little as TTL drive deflection circuitry and tube, or a complete chassis mounted tilt selectable display containing integral power supply, composite video input and deflection circuitry.

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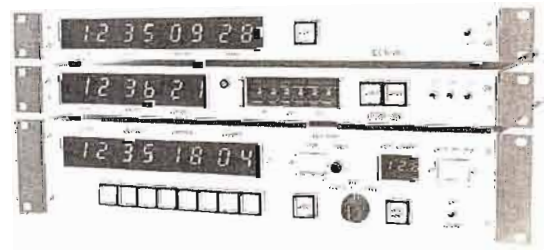
SMPTE Edit Code Generator and Reader,
Edit Memory Control, Time Code/Computer Interface, Character Generator, Syndicated Tape Programmer, Delay Program Controller ....



All Kaitronics equipment are designed for easy integration into your existing editing system, syndicated programming, news, delay program recording and other station operations.

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KAITRONICS **1540 Gilbreth Road, Burlingame, CA 94010** **Tel: (415) 697-9102**

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Transmission system

The Schaffer-Vega-Diversity System from the *Ken Schaffer Group* is a wireless (RF) transmission system designed to replace the audio cable between an instrument and its amplifier (or between the instrument and sound reinforcement system).

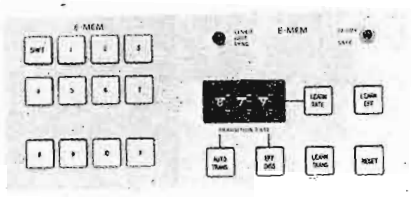
Model X10 transmitter has an audio input of 50,000 ohms impedance and an external audio level trimmer to adjust sensitivity.

Options include RF preamp for long antenna lines, 1:4 antenna splitter, multi-receiver mainframe with built-in antenna splitters and custom installation of the X10 inside the instrument.

Circle (339) on Reply Card

Production switcher

Grass Valley Group's Effects Memory System (E-MEM) uses a microcomputer which follows each movement an operator makes on the switcher.



Features include: an effects memory which stores all input crosspoints, wipe patterns, effects controls and all 15 analog channels in each register; auto transition present rate at 7-999 TV frames on a three-digit thumbwheel and error indication for overload.

Circle (340) on Reply Card

Frequency counter

A communications-type universal counter with a multi-stage pin diode attenuated AGC high frequency input channel (B) is offered by *Philips Test and Measuring Instruments.*

The instrument, PM 6616, optimizes triggering on RF signals up to 1.3 GHz, and on LF signals up to 80 MHz.

Rated at 10 mV sensitivity, the frequency counter offers a maximum degree of overload protection and noise immunity.

Circle (341) on Reply Card

Communications receiver

McKay Dymek Company announces the DR55 general coverage communications receiver.

High level RF front end design and digital phase locked loop tuning

continued on page 254

Switch to a better idea

Dual-channel tape reproduce amplifier for studio recording and broadcast automation. 3-speed EQ; lowest residual noise. Works with virtually all reproduce heads and transports.

Inovonics' Tape Reproduce Amplifier

Model 376–$550

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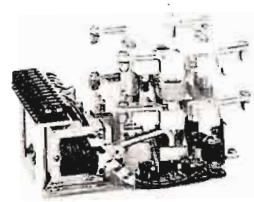

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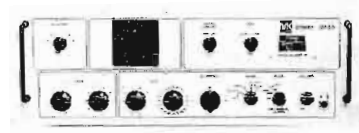
Circle (189) on Reply Card

New Products

continued from page 253

allow quick frequency changes.



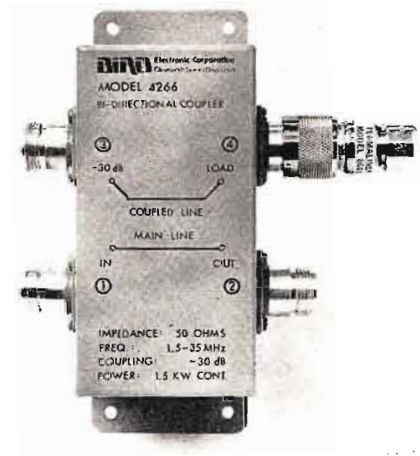
The unit has many applications in the commercial, governmental and marine areas including WWV monitors for time and frequency calibration, back up service for main receivers and point to point communications.

Circle (342) on Reply Card

HF coupler

The first in a series of high power couplers by *Bird Electronic Corporation* is model 4266.

High power, 4½ octave band width and coupling flatness are features of the bi-directional coupler.



It operates over the frequency range of 1.5-35 MHz at 30 dB below main line signal with a maximum deviation of ± ¼ dB (1/10 typical).

The coupler is symmetrical with a minimum directivity of 20 dB in either direction (25-30 dB is typical).

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Time code reader

Skotel model TCR-80 time code reader includes many features that make it a flexible production tool for producing television programs and commercials.

Standard features include: reading and display of time and user date at search speeds from hand turn reel speeds to more than 40 times play speed, a wide band preamplifier to read time code at fast and hand turn reel speeds, drop frame indicator, detection and bypass of code errors, automatic selection of record bias filter, 7 segment LED displays with contrast enhancing filter, selecting and holding in memory an edit point code without stopping the machine, and holding in memory the last address when the machine stops.

Circle (344) on Reply Card

Frame synchronizer

The FS-15 FE by the *NEC* Broadcast Equipment Division is designed to eliminate the common, ENG-related occurance of expanding blanking.

The FS-15 FE automatically expands the incoming signal both vertically and horizontally as it is digitized. Frame synchronization also takes place at the same time.

Expansion increments of 1% to 7% may be selected for accurate video versus blanking adjustment.

Circle (345) on Reply Card

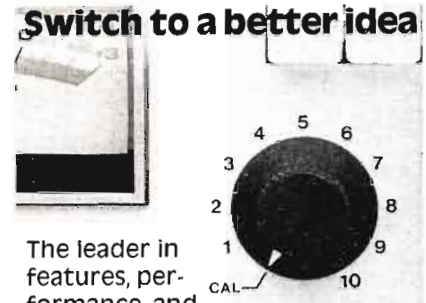
Character generator

Knox Video Products is offering model K128/MOD16 character generator which features a 16-page internal memory, multifonts (three uppercase, two lower), a character resolution of 1536 elements and a 3-position title window.

In addition, it has a dual channel

continued on page 256

Switch to a better idea



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Model 375 – $690

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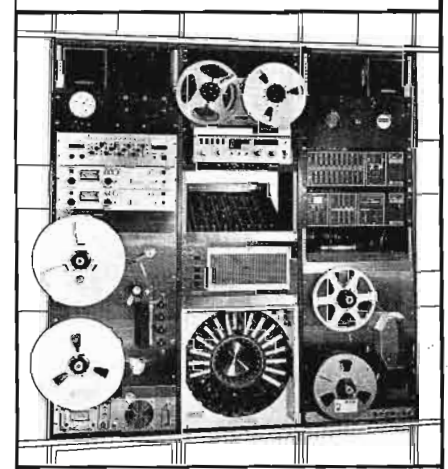

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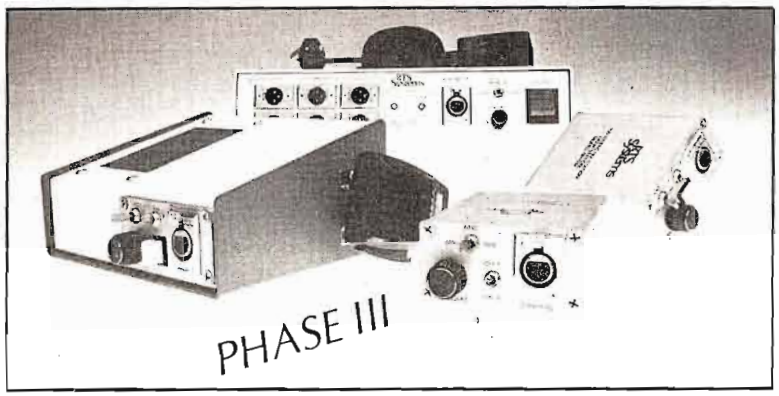
THE SUPER SYSTEM



RTS Systems introduces an innovative new intercom system for teleproduction communications in studio and field. With *Super System Phase III*, we've incorporated a number of advances which mark a significant increase in product versatility.

Our new design features the portability of 12 volt battery power and the convenience of dry-line operation. The system can be arranged with up to 50 various user stations on line, and may be coupled to existing communications lines using our new RTS interface devices.

Phase III offers impressive capabilities like powerful headphone amplification, two (or more) channel operation, microphone level limiting, and stable sidetone level. The new units are handsomely packaged and completely field serviceable.

With increased flexibility, improved circuitry, and greater reliability, our *Super System* represents a new development in meeting the demands of modern teleproduction. For additional information, contact RTS Systems, Inc.

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MANUFACTURER OF THE TCA-100 MONITOR/ALERT FOR THE TCR-100,IN USE IN OVER 70 MARKETS. ALERTS TO ANY CUE-UP OR REJECT MALFUNCTION. $212.50. AND THE PE-100 PLAY-EDIT ACCESSORY FOR ON-AIR TIME-EDITING OF BACK-TO-BACK NEWS STORIES, $49.50.

Circle (193) on Reply Card

New Products

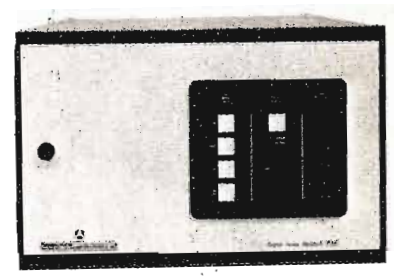
continued from page 255

output (edit and program) and automatic centering. The MOD16 also has expandable line length, italic mode, built-in mixer and RS232 interface.

Circle (346) on Reply Card

Noise reducer

An image enhancer and color corrector are optional plug-in features of the digital noise reducer offered by *Thomson-CSF Laboratories*.



The image enhancer features combed H and crispening, vertical and horizontal enhancement, dynamic black or white detail clipping, selectable in or out of system operation and luminance/chrominance timing.

The color corrector features instant painting without adjustment, consistent colorimetry for outdoor events, color films balancing, VTR, cameras, and selectable in or out of system operation.

Circle (347) on Reply Card

Micro camera

The *Hitachi* HV-9017 (NTSC or PAL version) is a single-tube, micro color camera designed for medical

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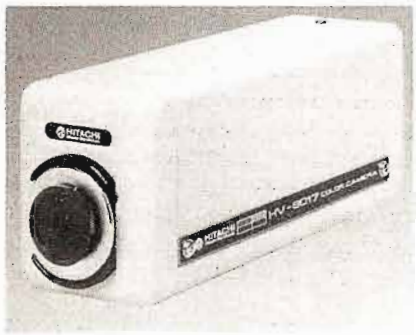
applications and research work by combining a microscope or a surgical operation microscope.



The 1-inch FIC (filter-integrated color) vidicon incorporates a color filter adopting a frequency separation multiplex system, ensuring sensitivity.

The camera is small scaled and light weight enabling direct mounting of the camera head to a microscope.

Circle (348) on Reply Card

Digital video recording system

Ampex is introducing an advanced digital video recording system that stores thousands of images and provides complete control in varying playback speed from still frame to normal play.

The ESS-2 system is a digital video alternative to film slide systems; in addition, it provides slow-motion production capabilities. It uses computer-type disc recording techniques (instead of analog methods) to offer variable record and playback.

The ESS-2 can be used to vary real time action sequences while

continued on page 258

PERFECT TIMING

Low Cost ESE Right On Timers

ES-300: Four digit incandescent display, one hundred minute timer (99:59) with six controls: Count Up, Count Down, Min-Set, Sec-Set, Stop, Reset. **$187.00**

ES-301: Identical to ES-300 except with planar, gas discharge display. **$206.00**

ES-302: Equivalent to ES-301 plus fast-set lever wheel programing. **$264.00**

ES-400: Three digit ten minute timer (9:59) with Start, Stop, Reset. **$109.00**

ES-510: Four digit sixty minute timer (59:59) with Start, Stop, Reset. **$139.00**

ES-500: Six digit, twelve hour combination clock/timer with five controls: Start, Stop, Reset, Fast Advance, Slow Advance. **$166.00**

STANDARD OPTIONS AVAILABLE: Kit; Slave; BCD Output; Remote Connector; 6' Remote Cable and Pushbutton Set; 220V A.C., 50Hz; 9" or 19" Front Panel 3½" high; 3 Wire Cord and Molded Plug. Tenths of seconds are available on all timers except the ES-500. Relay Contact Closure at Zero and/or Stop at Zero available on ES-300, 301, and 302. Crystal Timebase available for ES-500. Custom options and special orders available.

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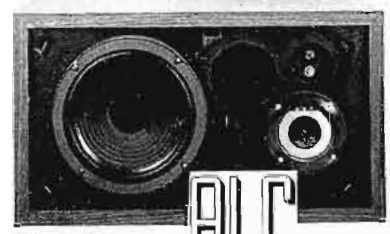

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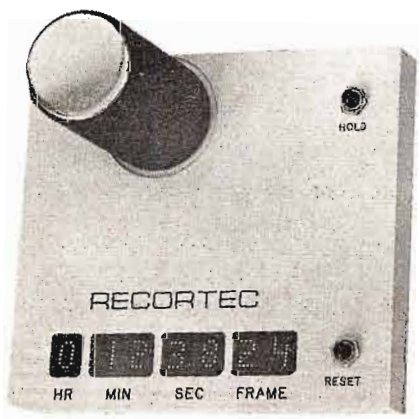

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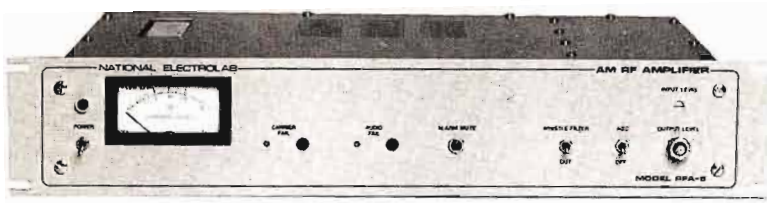
Set it and forget it



The NEW RFA-5 AM RF Amplifier

• 30dB AGC Range • Signal Strength Meter • Three RF Outputs for monitors, frequency counter and oscilloscope • Optional 600 ohm Balanced Audio Output and Carrier/Audio-Fail Alarms.

"Set it and forget it"—that's the comment most often heard from AM station engineers who have installed a National Electrolab AM RF Amplifier. The new RFA-5 is even better than the previous RFA-4. AGC is now standard, and a built-in carrier level meter makes setup easy. As well as driving most modulation monitors, the RFA-5 also delivers a low level oscilloscope output and a clipped/limited output for a standard frequency counter. Four double-tuned selective stages in the preamp, combined with a MOS-FET front end, provide outstanding performance in frequency-congested areas. Over 350 radio stations in Canada and the U.S.A. are presently using National Electrolab RF amplifiers. Try one yourself—and forget it. *For complete information, call any office of Gates Broadcast Equipment Div. of Harris Corp. or:*

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Canada: 1536 Columbia St., North Vancouver B.C. V7J 1A4 Phone (604) 985-0511

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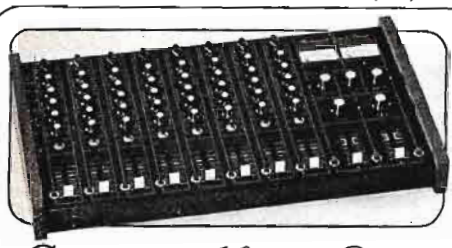

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Circle (199) on Reply Card

New Products

continued from page 257

maintaining a broadcast-quality picture. The system also provides control of video action in forward or reverse.

The potential for still picture usage is enhanced through the use of flying-head disc recorders. Color or monochrome stills can be filed for momentary access without the problem of physical deterioration, for rapid assembly into an unlimited array of sequences or complete programs.

Circle (349) on Reply Card

Color camera family

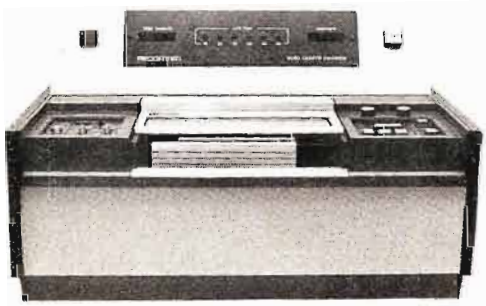
The Mark IX color television camera family from *Marconi* has been designed to suit a variety of operational requirements.

The cameras work from a control unit contained in one 19-inch rack mounting unit. The modular construction unit includes video processing modules, aperture corrector and color coder.

The studio camera is fitted with two filter wheels, the first containing three neutral density filters and the second two color correction filters. A third position on the second wheel is available for effects filters.

Still the industry's MOST NEEDED

VIDEO CASSETTE EVALUATOR



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- Edge damage counter
- Gross error counter
- Measures cassette length
- Still useful as recorder

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Circle (200) on Reply Card

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A choice of viewfinders is available.

Circle (350) on Reply Card

Camera

Ampex has introduced a color EFP camera which is 5 pounds lighter than conventional EFP cameras and requires 27 watts of power, permitting 90 minutes of operation from a battery belt.

Broadcast picture quality and colorimetry are optimized by magnetic ⅔-inch Plumbicon tubes with a high transmission f1.4 prism system, dynamic beam control, switchable black stretch, bias light for minimum lag and full 2-line vertical and horizontal contour correction.

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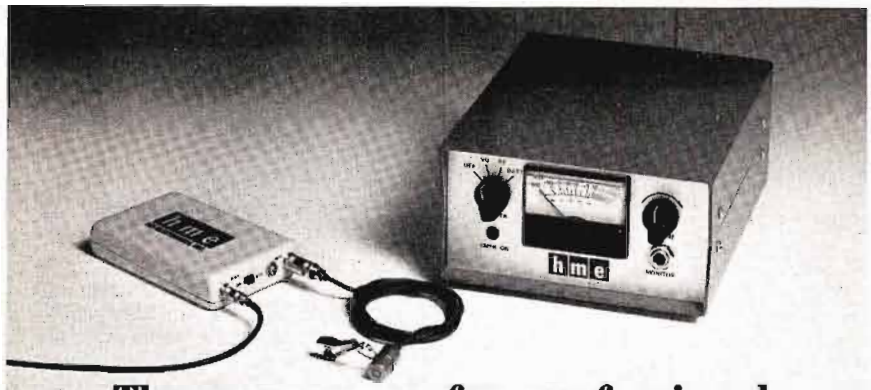

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New Products

continued from page 259

from a conventional AC supply in the studio.

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Video compressor

Colorado Video Incorporated's third generation compressed video system is designed to transmit still TV pictures over standard dial-up phone lines. The model 260B video compressor accepts signals from a conventional professional video camera and reduces the bandwidth by a factor of several thousand for coupling to the telephone systems.

At the receiving location, a model 275B video expander, with solid-state picture memory, reconverts "slow scan" signals to normal TV standards for viewing, distribution, or videotape recording. Nominally, 78 seconds is required to transmit a single image with a resolution of 270 TV lines. An optional 35-second mode with lower resolution is available.

Applications include teleconferencing, telemedicine, instruction, remote environmental monitoring, and security. Either simplex or duplex configurations are available, and the equipment may be inter-

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Camera pedestal

A compact, lightweight pedestal designed to support studio and ENG-type video cameras weighing up to 90 pounds is available from *Innovative Television Equipment.*

The ITE-P6 pedestal utilizes constant torque spring assemblies to provide counter-balance for lighter weight cameras.

The unit features crab steering and column elevation both controlled by the steering wheel. Its dual, 6-inch ball-bearing wheels have polyurethane tires equipped with adjustable cable guards, and are gimbal-mounted to ensure

continued on page 262

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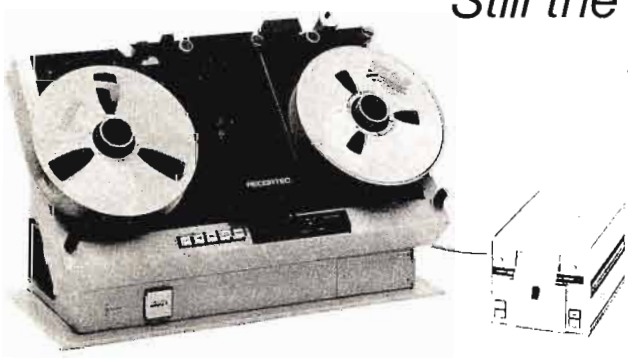

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New Products

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smooth movement on floor surfaces. The pedestal will elevate from 33 inches to 52 inches and has a doorway width of 28 inches.

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Color camera

Introduced by *Sharp Electronics Corporation*, the XC-300U modular CCTV color television camera is designed in four detachable sections and can be used in five different situations.

The detachable modules include: C-Lens mount, camera head, camera control unit, and 4.5-inch view finder.

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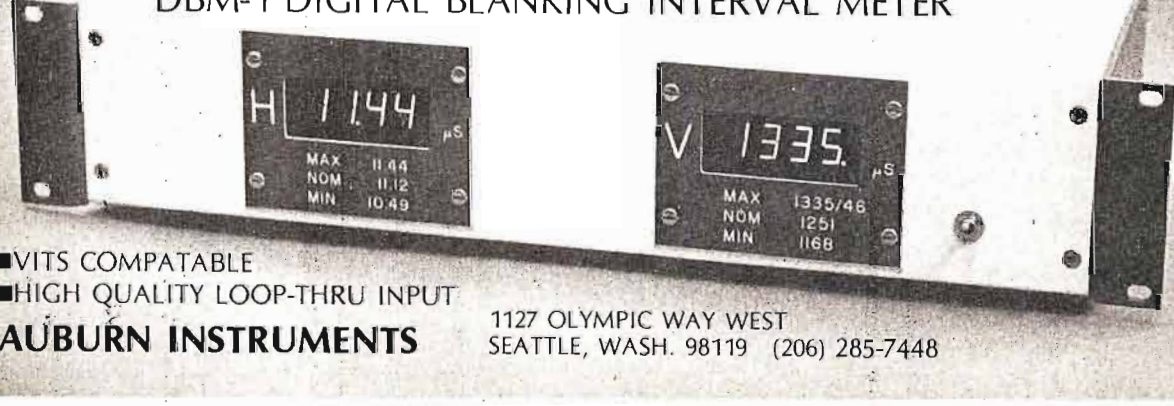

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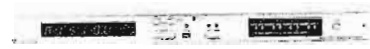

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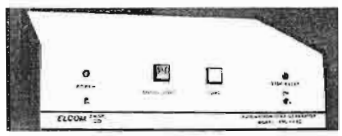

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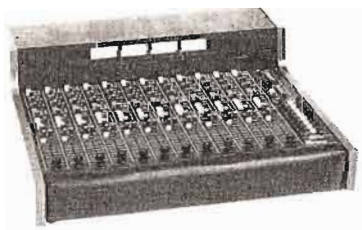

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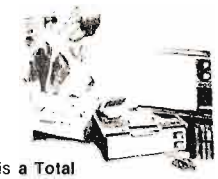

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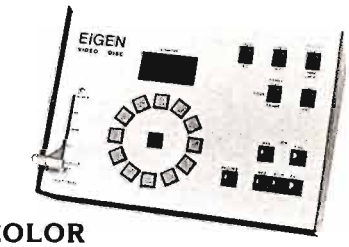

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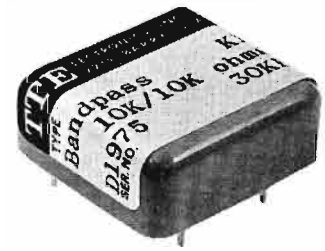

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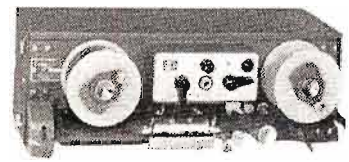

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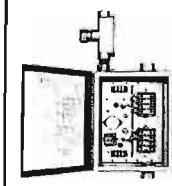

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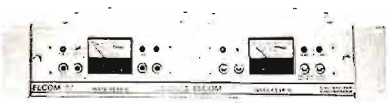

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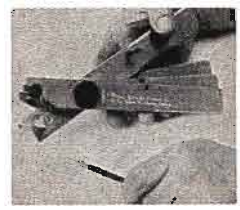

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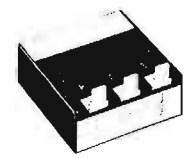

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SALES MANAGER—VIDEO PRODUCTS: Southern California manufacturer is seeking someone with experience in sophisticated video products and who is acquainted with all areas of market—Broadcast, post-Production and Industrial. Salary commensurate with experience. Send resume and salary requirements to: Broadcast Engineering, Dept. 428, P.O. Box 12901, Overland Park, KS 66212. Equal Opportunity Employer. 9-78-1t

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HELP WANTED (CONT.)

BROADCAST ENGINEER
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2 years of TV and engineering experience plus a first class license. Please call or submit application to San Diego Community College District, 3375 Camino Del Rio S., San Diego, Ca. 92108, (714) 280-7610, Ext. 227. 9-78-1t

ENGINEER I Television, closed circuit system. Responsibilities: Operation, preventive maintenance, and repair of television and related equipment, including quad and helical VTRs, broadcast, and CCTV cameras. Requires: BSEE and experience in television, or minimum two (2) years electronics training beyond high school and three (3) years television experience. First class FCC license desired. Salary: $13,000 and benefits. Affirmative action employer. Contact or send resume to: Jim Kirklin, Division of Instructional Communications, Western Michigan University, Kalamazoo, MI 49008. 9-78-1t

TELEVISION MAINTENANCE SPECIALISTS. Are you a specialist in the maintenance of quad video tape recorders?, or studio and portable camera systems?, or computerized editing systems? A large southeastern TV production center has positions available for highly qualified and experienced technicians specializing in any of these areas. Paid insurance, 3 weeks paid vacation, 12 holidays per year. Send complete resume to Box 426, Broadcast Engineering, P.O. Box 12901, Overland Park, KS 66212. An Equal Opportunity Employer. 8-78-2t

VIDEO TECHNICIAN/SHOP manager needed at large nonprofit media center. Extensive experience with maintenance and repair of ½" VTRs, ¾" VCRs, cameras and editing systems, also, experience supervising shop functions and personnel. Contact: Suzanne Langle, Young Filmakers/Video Arts, 4 Rivington St., New York, NY 10002. 8-78-2t

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HELP WANTED (CONT.)

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REMOTE TELEVISION VAN. MUST HAVE AT LEAST FOUR CAMERA CAPABILITY PLUS ROOM FOR VIDEOTAPE AND SLO-MO. CONTACT ROBERT O. DONAHUE, WMAR-TV, 6400 YORK ROAD, BALTIMORE, MARYLAND 21212. 9-78-3t

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FIELD SERVICE ENGINEERS—We are seeking individuals with maintenance and installation experience on videotape recorders and digital test equipment. These individuals must have completed technical training school or have equivalent training/experience, and are willing to travel. Our company offers a good starting salary and an excellent fringe benefits program. For immediate consideration, send resume with recent salary history to personnel department: DATATRON, INC., 1562 Reynolds Avenue, Irvine, CA 92714. 9-78-1t

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OPERATING AND MAINTENANCE TECHNICIAN for color production/closed circuit TV facility. Major state university. Send resume and salary requirements to: Robert Keidan, Ohio State University, Nisonger Center, 1580 Cannon Drive, Columbus, Ohio 43210. 9-78-1t

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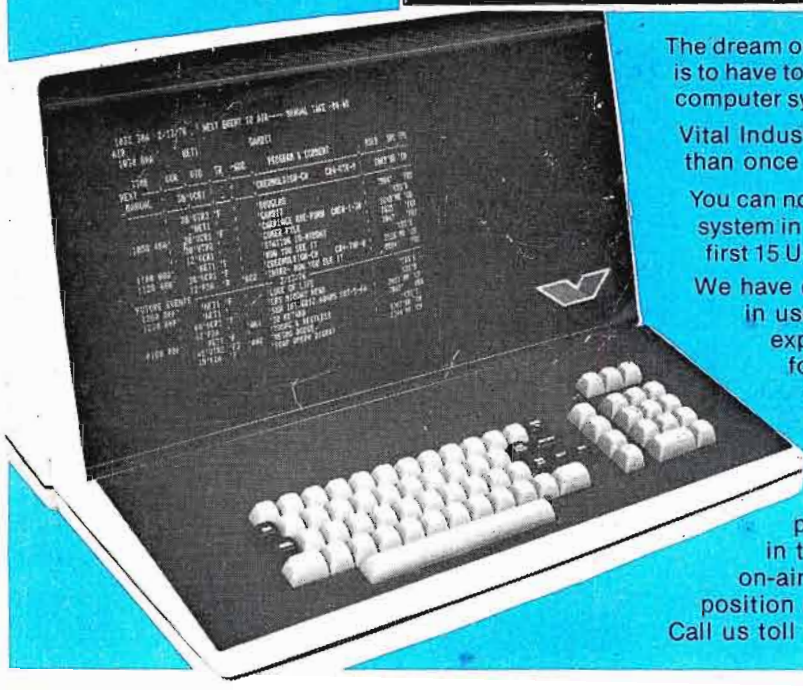

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